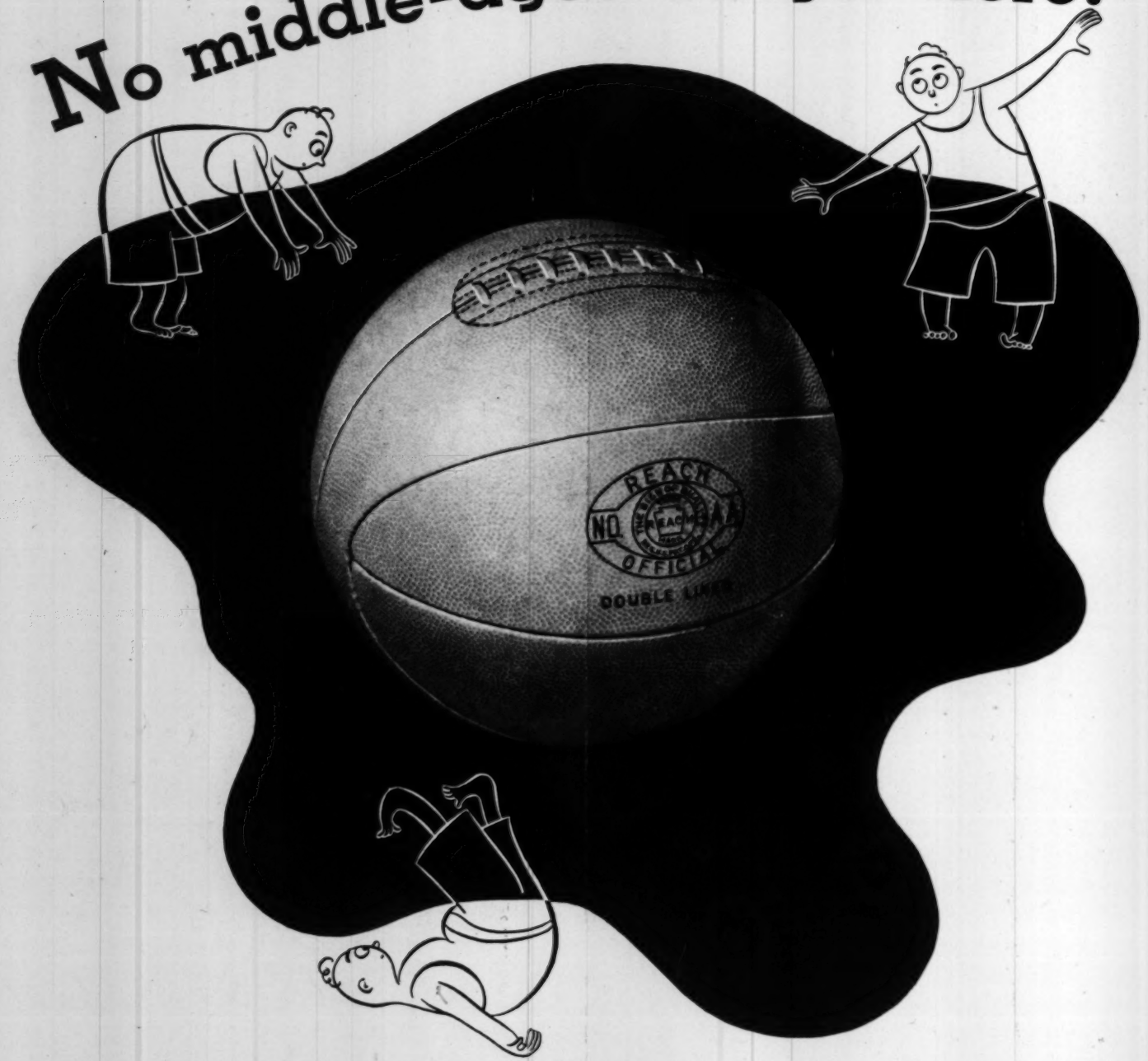
SCHOLASTIC COACH

December 1934

LEFT—Getting ball to pivot player by rolling it along floor. No. 6 fakes a bounce pass, chest pass, or dribble, to his right, then quickly shifts ball to his left side and, with left hand, rolls it past guard's right foot. No. 6 should then drive straight along path of ball, receiving back-pass as guards jam up. BELOW—Pivot-player serving as screen for teammate, No. 5, who comes out to receive pass, cutting close around pivot player, who becomes a moving screen.

No middle-aged bulges here!



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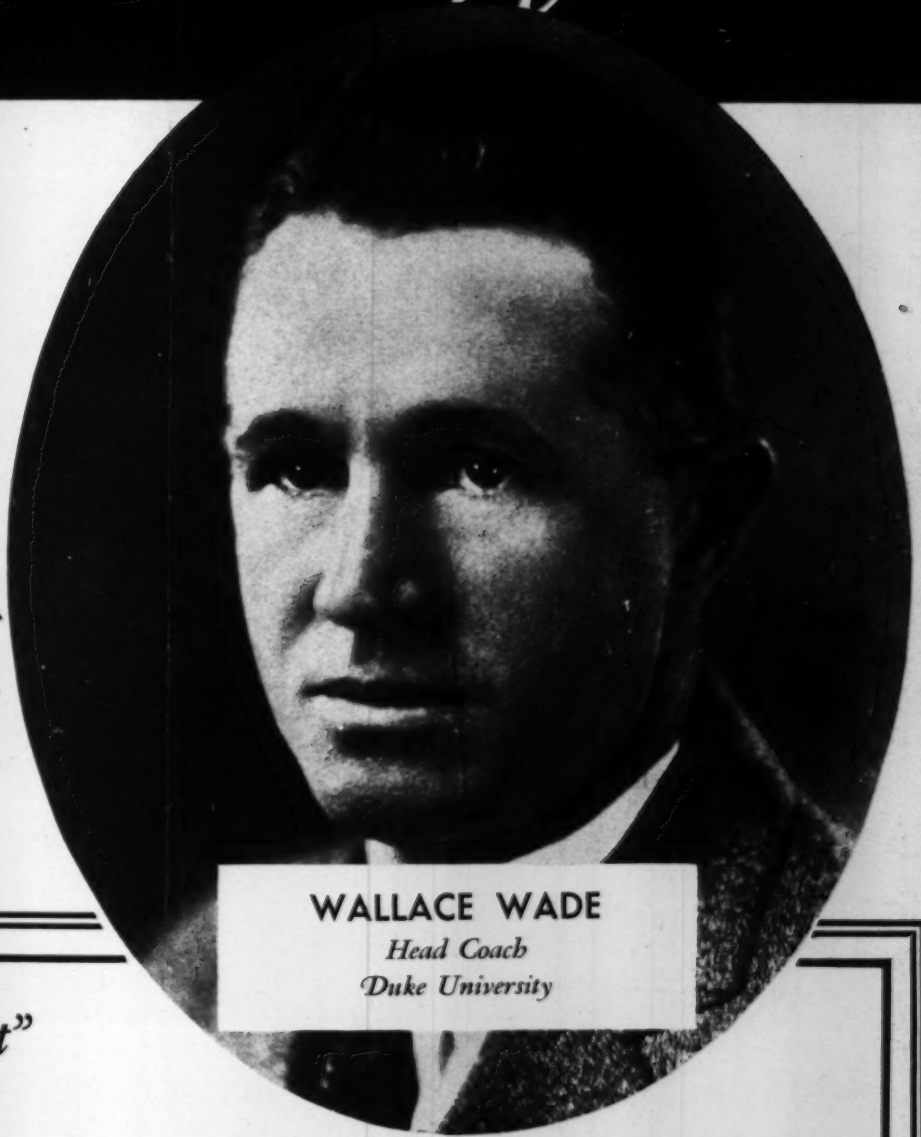

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5 Exercise every day, in the fresh air if possible.

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7 Don't over-eat.

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9 Stand and walk erect — breathe deeply.

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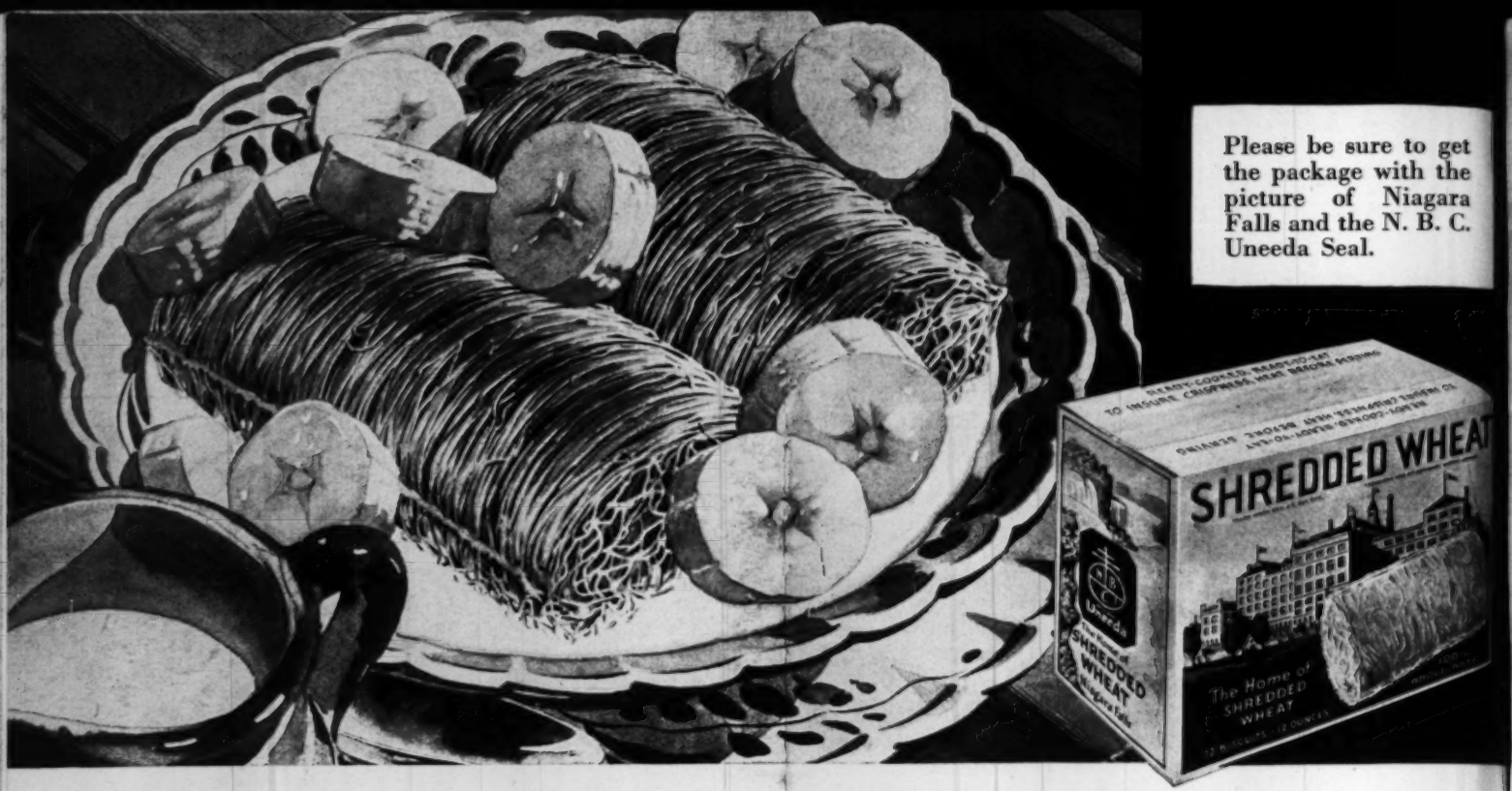

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SCHOLASTIC COACH

Reg. U.S. Pat. Off.

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VOL. 4 No. 4 JACK LIPPERT, Editor

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Girls' Basketball Film

A 16 mm. moving picture film, *Girls' Basketball Fundamentals*, giving the latest rules interpretations and analysis of fundamental skills, has just been issued by Scholastic Coach under the auspices of the Committee on Women's Basketball of the American Physical Education Association. The film may be rented at the rate of $1.50 for twenty-four hours, plus cost of mailing. Applications now being received for January rentals. Send reservation and money (check, money order or school purchase order) either to Miss Wilhelmine E. Meissner, Flushing High School, Flushing, N. Y., or to Scholastic Coach Bookshop, 155 East 44th St., New York, N. Y.

Whether in football or basketball, it's Speed and Mobility that count. The defending team in today's game can't prevent a score standing back on its heels—it has to get into the scrimmage hard and fast and break up the plays before they have a chance to form. And the only *possible* advantage the attacking team has, is the opportunity of getting into action first, of swiftly swinging a corps of moving men into an area its opponents have left momentarily undefended.

All of this calls for *footwork* as well as brainwork. And for footwork, today's athletics demand a shoe that is strong (for safety), light and supple (for speed and quick feints) and soft and pliable for foot health and foot comfort.

Kangaroo is 17% *stronger*, weight for weight, than any other leather used in shoes. It is lightweight, featherweight, and as soft and as pliable as fine kid. That's why it is the choice of athletic stars and championship teams year in and year out.

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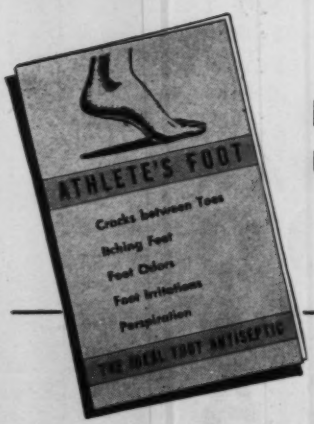

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HERE BELOW

ON the promise of Germany that she will show no discrimination against Jews in making up her Olympic team for the 1936 Olympic Games in Berlin, the American Olympic Committee has accepted Germany's invitation to participate in the games. While there is plenty of evidence to show that Germany is officially discriminating against her Jewish citizens in various ways, the American Olympic Committee chose to ignore all evidence of discrimination that did not pertain to sports. Avery Brundage, president of the American Olympic Committee, recently returned from Germany with the assurance of the German sports leaders that Jews and Gentiles would receive equal consideration in sports. On the basis of that promise, and that it will be fulfilled, the United States will be represented at the Games in Berlin.

We believe that Germany's discrimination cannot be parceled out and pigeon-holed in this manner, and that the general discrimination against the Jews is bound to be felt in sports.

The American Olympic Committee was in a tough spot when it came to make its decision, because had it turned down Germany's invitation it would have set the precedent of taking into account the host nation's political problems in considering an invitation to "come and play ball with us." The question could then be raised as to whether the U. S. should send a team to Russia, Japan, Italy or any other government whose goings-on do not meet with American approval. It is true that the German government is doing a thing that no other modern government has been guilty of—officially discriminating against some of her citizens, not because of their political beliefs, but because they happen to be Jews.

Home work

IN our own Land of the Free we are far from innocent of the prejudice and discrimination of which Germany stands accused. We do not always carry our bigotry to the extreme of embodying it in our laws, but it comes out into the open in various ways, none more conspicuous that on those occasions when a Northern college team, with a Negro in its lineup, is scheduled to meet a Southern college team, with only White gentlemen in its lineup. This situation developed again on October 13 at Ann Arbor between Georgia Tech and the University of Michigan. Willis Ward, a Negro, Michigan's regular right end, was kept on the sidelines. No explanation for this action was forthcoming from anyone officially connected with the Michigan coaching and athletic staff. No official statement was made by the Michigan Board in Control of Athletics. *Time*, the Weekly Newsmagazine, said: "Athletic authorities insisted that he [Willis Ward] should not play because 1) it would be discourteous to Georgia Tech; 2) he might be injured." There was no authority for the rumor that Georgia Tech had requested Michigan not to use Willis Ward. But there was no doubt that Georgia Tech appreciated Michigan's gesture, because as a reciprocal gesture Georgia Tech kept her star end, Gibson, out of the game. So, there was sportsmanship of a kind displayed, but it was definitely reserved for the Whites. After the game, which, incidentally, was Michigan's first and only victory of the season, *The Michigan Daily*, student publication, said editorially: "Michigan is democratic. Its history, its tradition, its honor is founded on a bed rock of education for all those who are capable of getting it, regardless of race, or color, or social and financial position. Those principles are incompatible with the South's position on racial differences. Let Michigan of the future play with those who are of her own eminently worthwhile type."

"The South, suō, refuses to defend the No'th goal."

Copyright 1934, *Life* magazine.

Mixed colors & feelings

A YOUNG friend of ours who recently graduated from a Southern high school, is now taking a post-graduate course in a Northern prep school for polishing-up purposes, or something. A football player, he stepped on the field for a game against a neighboring high school team and, lo and behold, saw a Negro in the opponents' backfield. The White boy experienced a quick sinking in the stomach and felt extremely uncomfortable, so he wrote, for his whole harmonious color scheme of life was being suddenly streaked. But he went in and played the game, although he admitted afterward that it distressed him no end to have to tackle the Black boy. The White boy kept his feelings to himself and played the game, because it was at once apparent to him that everybody else was taking the Black boy's presence for granted. The White boy, accustomed to seeing Blacks do whatever retreating is called for, would himself have become the social mis-fit had he marched indignantly off the field because of a Negro's presence in the game. Here was a strange turning of the tables of irony. Here was a new conception of sportsmanship in the making.

Research in Yells

LOOKING over hundreds of high school yells, submitted by students in the College Emblem Shop contest, we were struck by the classification into which the majority of them fall: the majority are of the blood-thirsty, "killer" and rough-tough type, ranging from murder by boiling in oil to mere [Concluded on page 24]

Postum shoots five

"Coffee may cause bad effects on many boys, such as 'nerves,' etc. If so, substitute Postum." — C. M. Price, Basketball Coach, University of California.
"The growing youth who is athletically inclined will make no mistake by drinking Postum daily." — Charles E. Barrett, Trainer, Columbia University.

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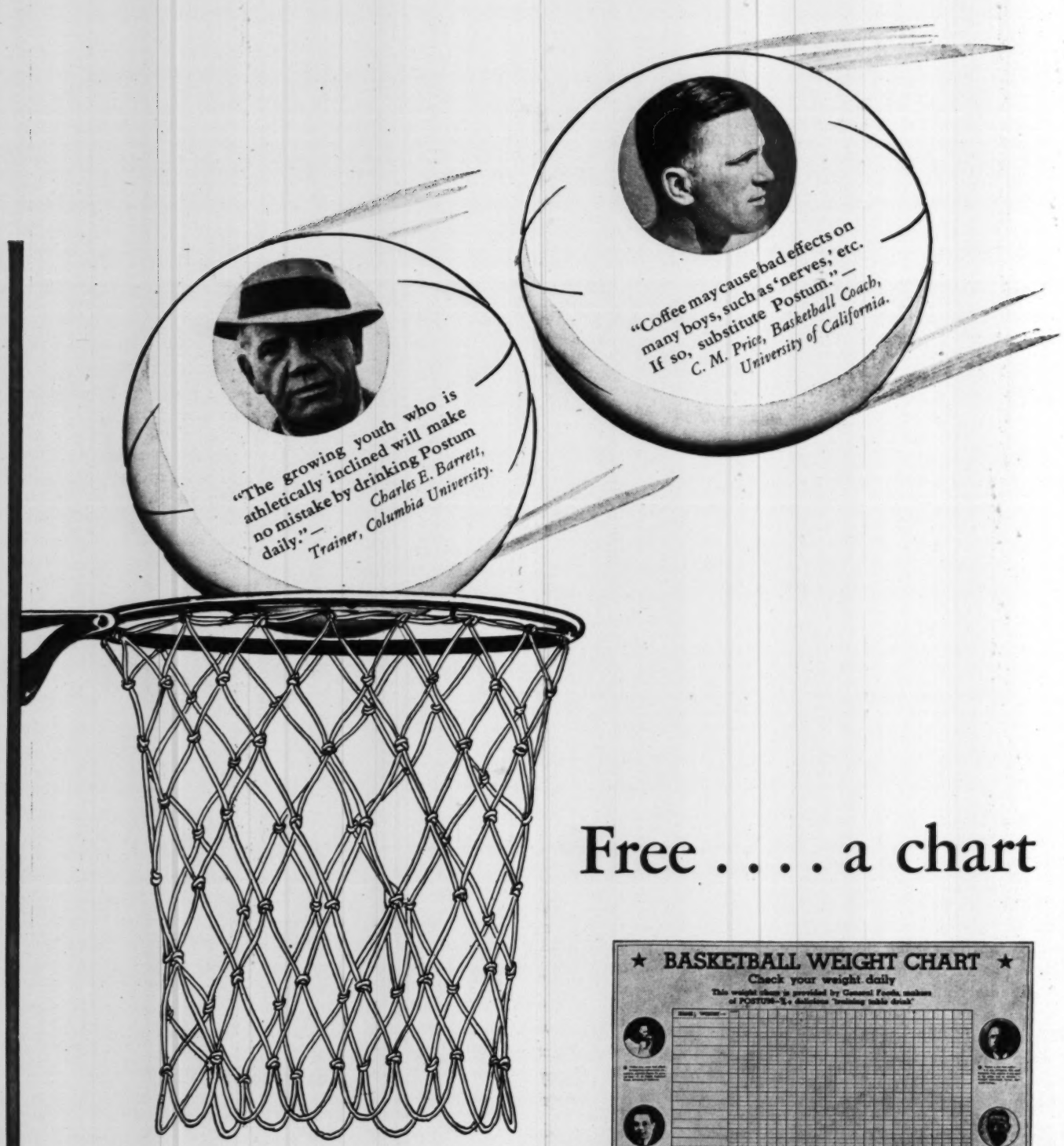
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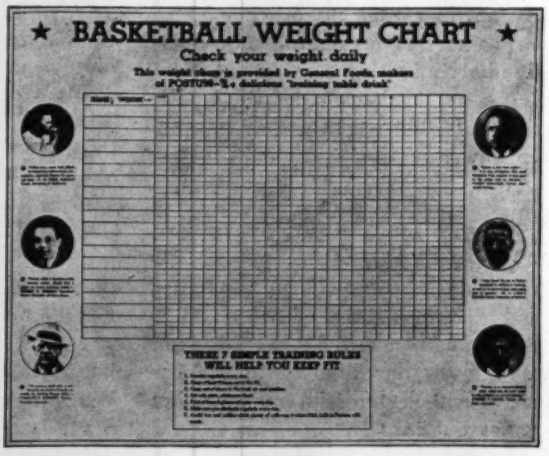

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RUNNING INTO THINGS WITH NAT HOLMAN

Suggestions on how to keep the other team guessing and out of your way

By Lester Bromberg

THE visitor to one of the early-season basketball practises in the gymnasium of the College of the City of New York, where Nat Holman is starting his seventeenth year as coach, is likely to see the players going through the "mat drill." Two assistant managers will be holding a wrestling mat upright, while the squad goes through a drill based on the "run the man into the mat" theory. The mat represents an opponent, and the idea of the drill is to train your players to cut and run, stop reverse and go, so that the opponents will be running into each other or into your own screening men. If they run into each other, as they are likely to do if they are playing a man-to-man defense and are not expert at switching, they will be freeing one of your men for a shot. If they run into your own stationary men, as they may do in attempting to cover certain areas in the zone defense, the foul is on them for charging. There is no telling what an opponent will do when you run right up to him and make a quick reverse!

Diagram 1

Diagram 1 shows one of the "run the man into the mat" drills. Here the defense is functioning as a man-to-man defense, the type used generally by Nat Holman's teams and their opponents. The drill may be conducted with or without defensive players; or with only one defensive player. The main purpose of the drill must not be lost sight of: which is to teach the players to cut so as to cause opponents to run into themselves or into one of your players who no longer has possession of the ball. The mat is used to save wear and tear on players. It may be held upright in the free-throw lane, or to either side of it.

No. 1, with the ball, bounce-passes in to No. 2, cutting diagonally so that he just misses the corner of the mat. No. 3, starting with the first pass, goes straight down the alley, then swerves sharply in toward the mat, and runs at top speed directly in front of it, when he quickly reverses and cuts off to the left close to the mat. No. 1, after passing, runs to the right, then cuts back to the left. No. 2, after receiving the pass, may hook-pass over to No. 1 or No. 3, or dribble in. Under game conditions, an effective switch may have stopped No. 2, in which case he can dribble or pivot toward the right sideline, and make a back-pass for the start of a new attack.

Weaving and interlacing which results in this incidental screening, rather than deliberately set-up screen plays, is the basis of the offense taught by Nat Holman. "We don't run indiscriminately, of course," he said, "but neither do we follow any charted course, such as the figure 8 or triangle. Our players are drilled in all the maneuvers which go to make for good weaving — change of pace, quick stops, reverses, feints — and are then left to follow their individual inclination. They get to know what to expect of each other. We emphasize running behind the ball, because it means the difference between incurring fouls yourself or leaving that unpleasant business to the other fellow."

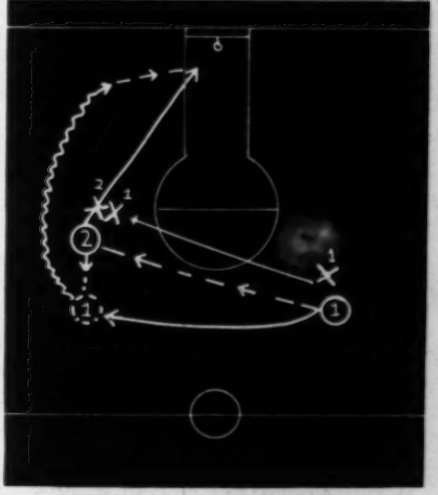


Diagram 2

What it boils down to is that Holman's screening plays are not designed as such. They are not planned pick-offs (the old blocks). The weaving and interlacing of players evolve situations where the defense begins to run into itself or into the offensive players.

Holman's teams usually start their games by trying the conventional pivot attack. Should this be stopped, the next phase is to work the pivot play from any point in the scoring area, each of the five men becoming pivot men as the occasion arises. If this does not bring the desired results, or if a lead is obtained, a more delayed attack will be tried. Against a zone defense this may succeed where the pivot-attack failed. The object is to send a potential pass-receiver into an area which has just been opened by luring away the defensive guardian by a wide distribution of three offensive players within the scoring territory.

Diagram 2 shows the possibilities of a typical set play. The defense is functioning as man-to-man. The same type of play would be potent against a zone defense for it sends two men, moving into the same zones, while three other offensive players keep the defense spread. No. 1 passes over to No. 2 and moves over directly behind him. At the approach of a defensive player, No. 2 back-passes to No. 1, who dribbles down the alley behind No. 2's screen. Against a man-to-man defense, as a check against successful switching, No. 1 can cut off to the right of No. 2 if he sees that X-1 has moved to guard No. 2 in anticipation of a switch on which X-2 would take No. 1.

"A most valuable asset in playing this type of game is dual vision — the capacity to watch the ball and keep an eye on the movement on the defense," Holman said. "If you can see what the other man is about to do without his knowing that you have anticipated him, you have a weapon which will be of great use in the weaving and screening game."

On offense, the players who are not handling the ball at the moment can use the reverse and the cut-back in a variety of ways as an instrument of deception. So that this deception does not become a boomerang, it is necessary to have five players on the floor who know what to expect of each other.

THE DETAILS OF PASSING AND SHOOTING

By William H. Anderson

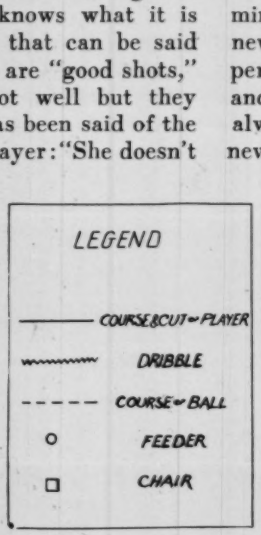
The coach of the Lower Merion team presents a series of drills for developing thoroughness

This is the first of two articles by the coach of the Lower Merion High School (Ardmore, Penna.) basketball teams, winners of 130 games, losers of 26, during the past seven years. Numbered among Lower Merion's souvenirs of this period are one Pennsylvania state championship and two eastern regional titles. Mr. Anderson writes on passing and shooting this month. Next month he will write on team offense and defense.

IT is every basketball coach's dream to have a team that can keep possession of the ball until ready to shoot. If the five boys on the floor can, as a general thing, keep the ball moving among themselves until the scoring opportunity comes, they are going to turn in their full share of victories as a matter of course.

A basketball team's "Work of Art" is in its passing attack. The knowing spectator with an eye for the fundamental values of the game, will exclaim, "They play beautifully," of the team whose passing attack is clicking in a sure pattern. The mere shooting team that cannot keep possession of the ball until the reasonable scoring opportunity presents itself, never arouses such unadulterated delight in the spectator who knows what it is all about. The best that can be said of them is that they are "good shots," or "they don't shoot well but they shoot often," as it has been said of the neighboring piano player: "She doesn't play well, but she plays loudly."

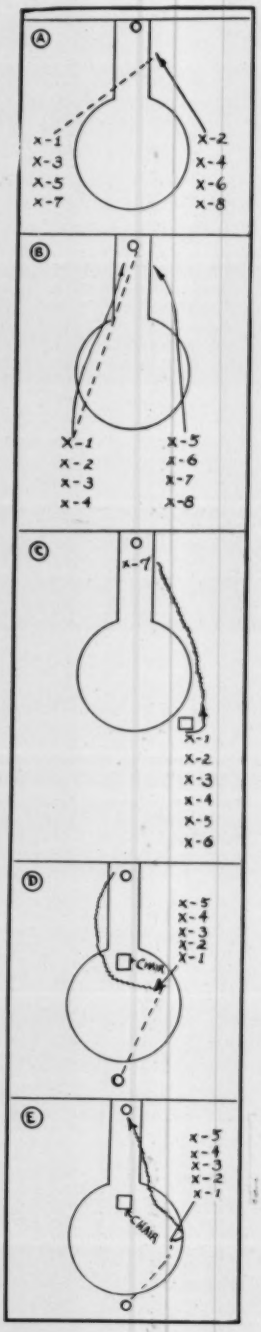
There is no excuse for a team of good shooters not being a team of good passers. It lies within their physical power to become a good passing team, for a player who shoots well is one who handles the ball well, and the skill of passing the ball is but a by-product of good, general ball-handling. It is usually temperamental difficulties, or the lack of leadership or coaching, that prevents the team of good shooters from becoming a good basketball team in the full sense.



At Lower Merion we place a great reliance on fundamental drills to develop our players in good basketball habits. We use them throughout the season and do not give them up even when preparing for tournament games. These drills, in the order of their logical development, appear with this article. It is detail that we are after in these drills, and we go over them and over them until the boys are really habituated to doing the right thing. The aim of each group participating in a particular drill is to achieve individual and group perfection in that drill, even down to lifting the shot up for a basket. We want that practice basket at that moment as much as we want the game basket. And we want no less accuracy and near-perfection in the movements that lead up to the basket. Set up the ideal in technique for the players, repeating it for them from time to time so that they do not lose the picture of it, and let every move be made with that ideal in mind. Since perfection is never reached in constant performance, the coach and team have something always to strive for. It is never a hopeless quest, because effort is frequently rewarded by excellence and sometimes even perfection in certain movements or series of movements.

What, generally, do we ask for in passing the ball? We ask for nothing that is not generally known. Our "line" runs something like this: Aim them ahead of the receiver, waist high. "Hit the shirt" is the slogan. Gauge the speed of the pass by speed of the receiver and the direction of the receiver. If he is cutting for a lay-up shot, or surrounded by a jam of opponents, float him a high one—way above the usual shirt height. No blind passing allowed. See your receiver. Take no chance passes, watch for a possible interception by an opponent. Passing to a partially covered man is throwing the ball away. Never pass to a teammate cutting away from you with his back turned, wait until he has turned. Pass ahead of the runner at all times. Do not pass to a player who is frantically calling for the ball if you think he is covered and will not be in a position to receive your pass. Do not spin the ball in passing. Hold to the thought that every good pass leads to a score and a poor pass leads to loss of the ball and may mean the loss of the game. Sometimes, in passing you may be hurried and still get the ball away, but it is better to be forced into a held ball than have your pass go wildly out of bounds or into possession of the other team.

There are many types of passes, but most coaches have divided them into two classes: the one-hand



Drill A—Lay-up shot—X-1 passes to X-2 cutting in straight. X-1 recovers ball, returning it to X-3. X-3 passes to X-4. X-2 goes in back of X-7. X-1 goes in back of X-8.

Drill B—X-1 gets set and shoots. X-1 and X-5 follow-up the shot. The ball is returned to X-2. X-1 takes place behind X-8. X-5 takes place behind X-4. Later, shoot from the other line.

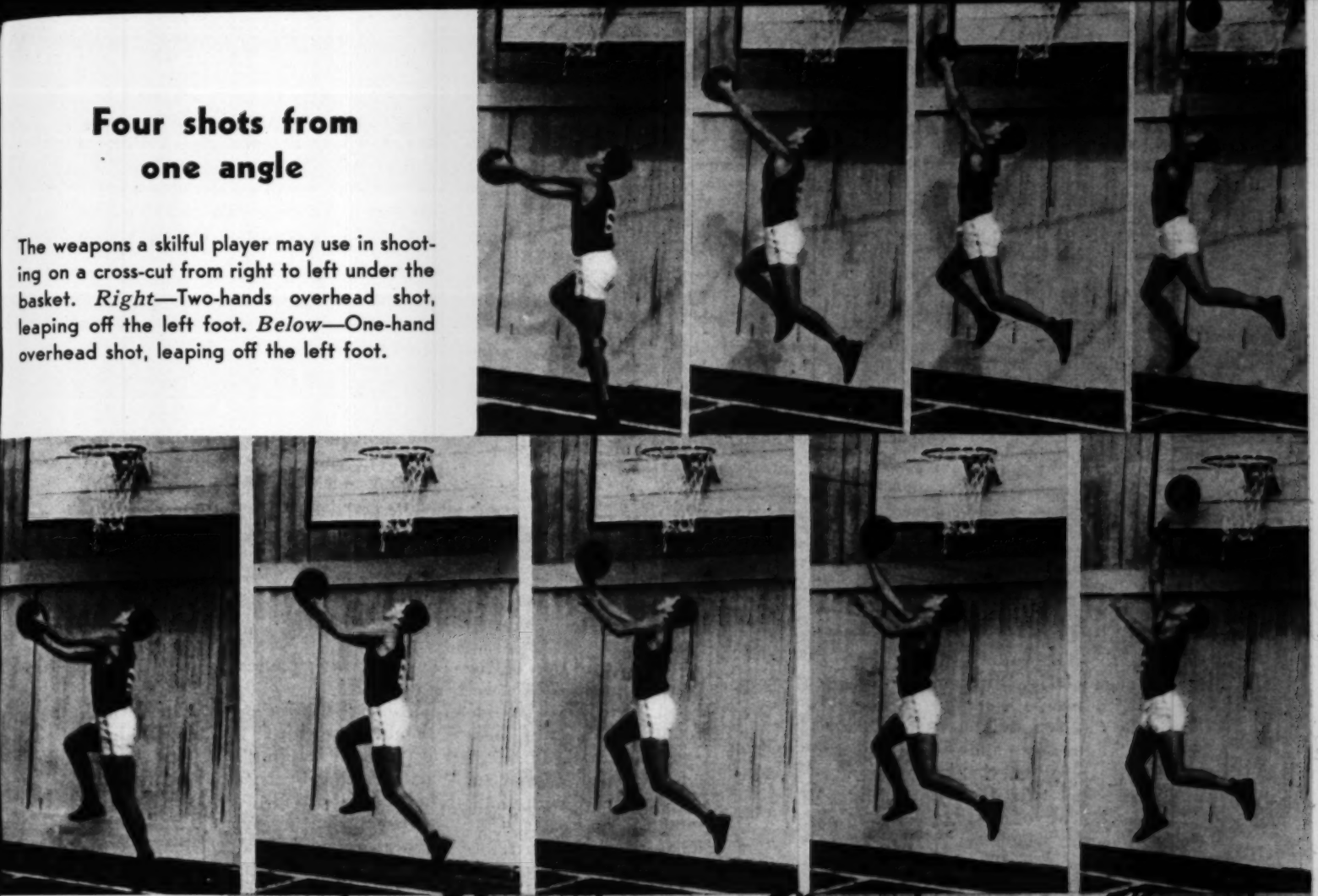
Drill C—Fake and dribble, with shot—X-1 fakes a long shot and dribbles around chair for lay-up shot. X-7 recovers and passes to X-2. X-1 takes place of X-7. X-7 takes place behind X-6. Same drill on both sides.

Drill D—Pivot, fake and dribble—Feeder passes to X-1 coming out of corner to meet pass. X-1 fakes return pass to feeder, pivots, and dribbles around chair for lay-up shot, X-1 returns ball to feeder and goes behind X-5. Drill can be used on each side, two lines going simultaneously, with two feeders.

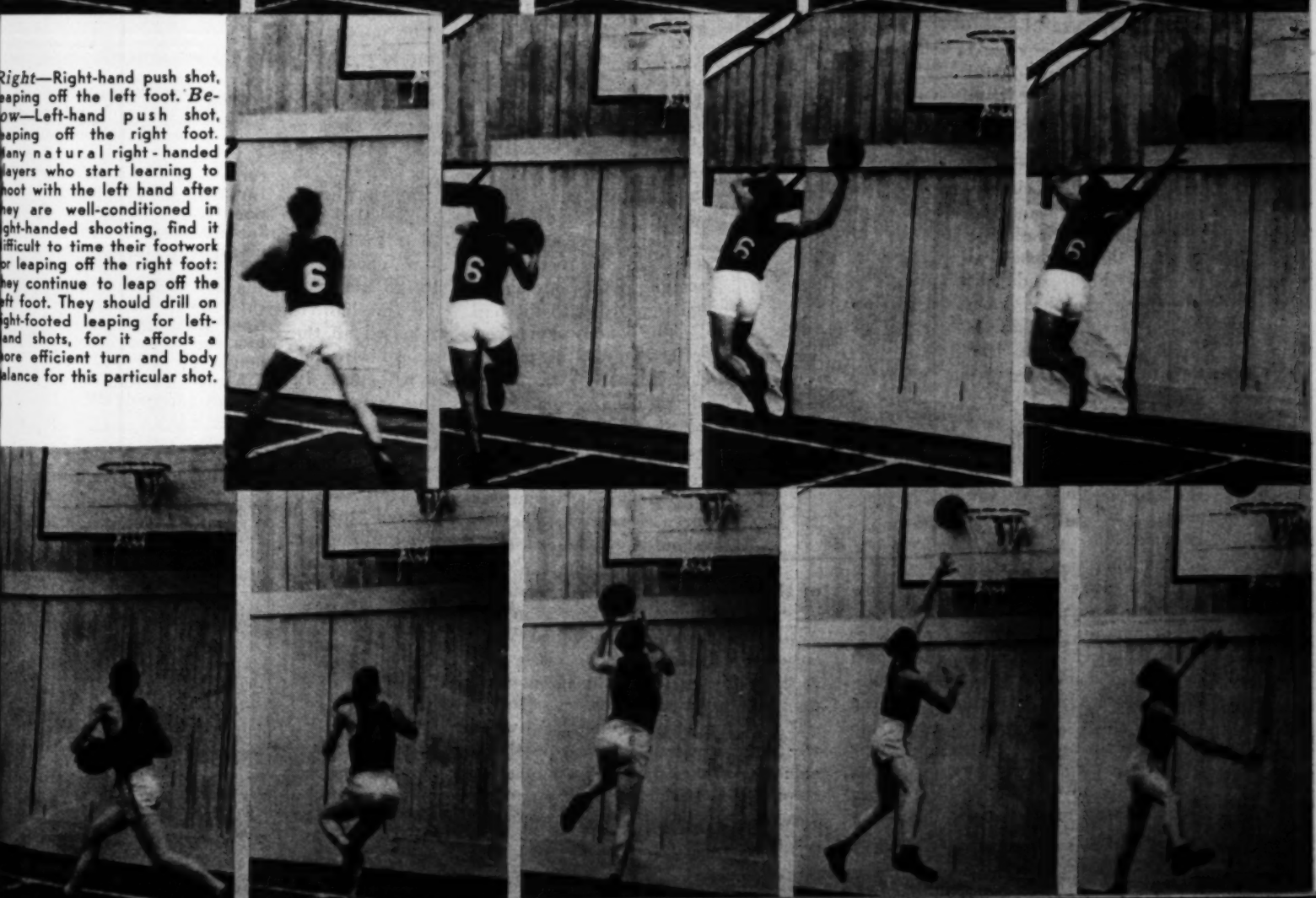
Drill E—Feeder passes to X-1 coming out. X-1 fakes pass to chair and does a reverse turn pivot toward side line, dribbling in fast for lay-up shot. X-1 returns ball to feeder and takes place behind X-5. Use this drill on both sides simultaneously with two feeders, and players alternating sides.

Four shots from one angle

The weapons a skilful player may use in shooting on a cross-cut from right to left under the basket. *Right*—Two-hands overhead shot, leaping off the left foot. *Below*—One-hand overhead shot, leaping off the left foot.



Right—Right-hand push shot, leaping off the left foot. *Below*—Left-hand push shot, leaping off the right foot. Many natural right-handed players who start learning to shoot with the left hand after they are well-conditioned in right-handed shooting, find it difficult to time their footwork for leaping off the right foot: they continue to leap off the left foot. They should drill on right-footed leaping for left-hand shots, for it affords a more efficient turn and body balance for this particular shot.



Drill F—Rebound drill—Feeder shoots for basket. X-1 and X-5 follow shot to recover rebound and shoot until goal is made. Ball is then returned to feeder. X-5 and X-1 go to rear of opposite lines.

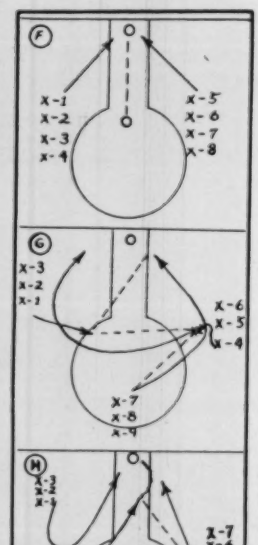
Drill G—X-7 fakes pass to X-1 and passes to X-4. X-4 fakes return pass but passes over to X-1. X-1 fakes return to X-4, then passes to X-7 cutting under the basket. All three follow missed shot. Ball is returned to X-8. X-7 goes behind X-6. X-4 goes behind X-3. X-1 goes behind X-9. First pass may go to either side.

Drill H—Feeder passes to X-4. X-4 passes to X-10 cutting across fast. X-1 comes out, then cuts back to follow shot. X-4 follows pass. Ball is returned to feeder. X-1 goes behind X-8. X-10 goes behind X-7. X-4 goes behind X-3.

Drill I—Feeder passes to X-10 who comes out to meet the pass. X-10 passes to X-4, who fakes return pass to X-10, but passes to X-1 who gives return pass to X-4 coming down the hole. X-1 and X-10 follow-up. X-10 goes behind X-3. X-1 goes behind X-7. X-4 goes behind X-8.

Drill J—Feeder passes to X-4. X-8 breaks fast for foul line, receiving pass from X-4. X-8 does a quick front turn, turning back to the basket, and fakes a return pass to X-4 who has followed his pass. X-1 cuts across in front of X-8, after X-4 has gone through, takes pass from X-8 and either dribbles into basket or hook-passes to X-4 who takes a shot. Ball is returned to feeder. X-8 goes behind X-7. X-4 goes behind X-3. X-1 goes behind X-10. Same drill may be used with two players on the right side.

baseball pass and the two-hand chest or push pass. Both have their special uses. The baseball pass is used for long, accurate passes. It is best to adjust the ball in the hand so that the fingers are spread on the laces. With the ball in this position, it can be thrown with greater accuracy and speed. Be careful that the player does not twist his wrist and, therefore, throw a curve, which is very hard to catch. The ball should be raised high and drawn back of the head. For a right-hand passer the left hand should be used to place and steady the ball as it is being raised to the position to be released. In passing the ball the fingers are drawn down and the arm follows through. Be careful that the ball is released high and not after the arm has gone too far forward and downward, which causes the ball to be thrown at the receiver's feet. I have found that these two points — twisting of the wrist and holding on to the ball too long—are the mistakes my squad usually makes.



The long pass has its place in every basketball game. How often have we seen one of our players either cutting or standing free under the basket only to see a bad pass thrown to him for a missed field goal? These long passes are hard to catch and the receiver must have his hands ready to give with the ball when it comes. Some players throw a very heavy ball which is difficult to handle. I have never found a way of correcting this without losing the necessary speed.

The two-hand chest, or push, pass is used almost entirely for short, rapid-fire work in the scoring territory, with the occasional interjection of the bounce pass. The two-hand chest pass is the foundation pass of modern basketball. It is the easiest to protect, and can be despatched with a minimum of notice. It lends itself admirably to feinting. The pass is executed by bringing the ball to the chest, body leaning forward slightly, palms of both hands behind the ball with only the fingers touching it. The ball is released by a simultaneous extension of the arms, and a final whip of the wrist. The elbows should be kept in comfortably close to the body. The weight of the body should go forward with the ball.

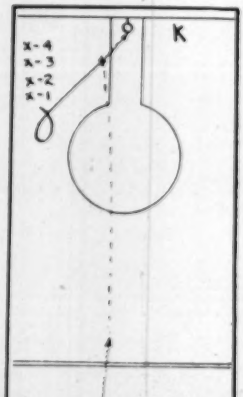
The bounce pass is very effective, and we use it a lot. Bounce passes can be despatched from either chest passes, two-hand side passes, or one-hand baseball passes. When no opponent is between passer and receiver, the ball should be bounced about a yard and a half in front of the receiver, who should bend over slightly to receive it, rather than wait until it rises to his convenience. When an opponent is between passer and receiver the ball should be bounced near the opponent's feet.

A variation of the bounce pass which we like a great deal is the one-hand, side-arm bounce pass. This is made by stepping out to either side of an opponent who is in close proximity, reaching out to the side with the ball in one hand, and whipping it with arm and wrist to a teammate. Ability to grasp the ball in one hand without the support of the other hand is almost indispensable to safe and reliable execution of this pass. It is a good pass to use when tied up with the ball and unable to use one of the more direct passes.

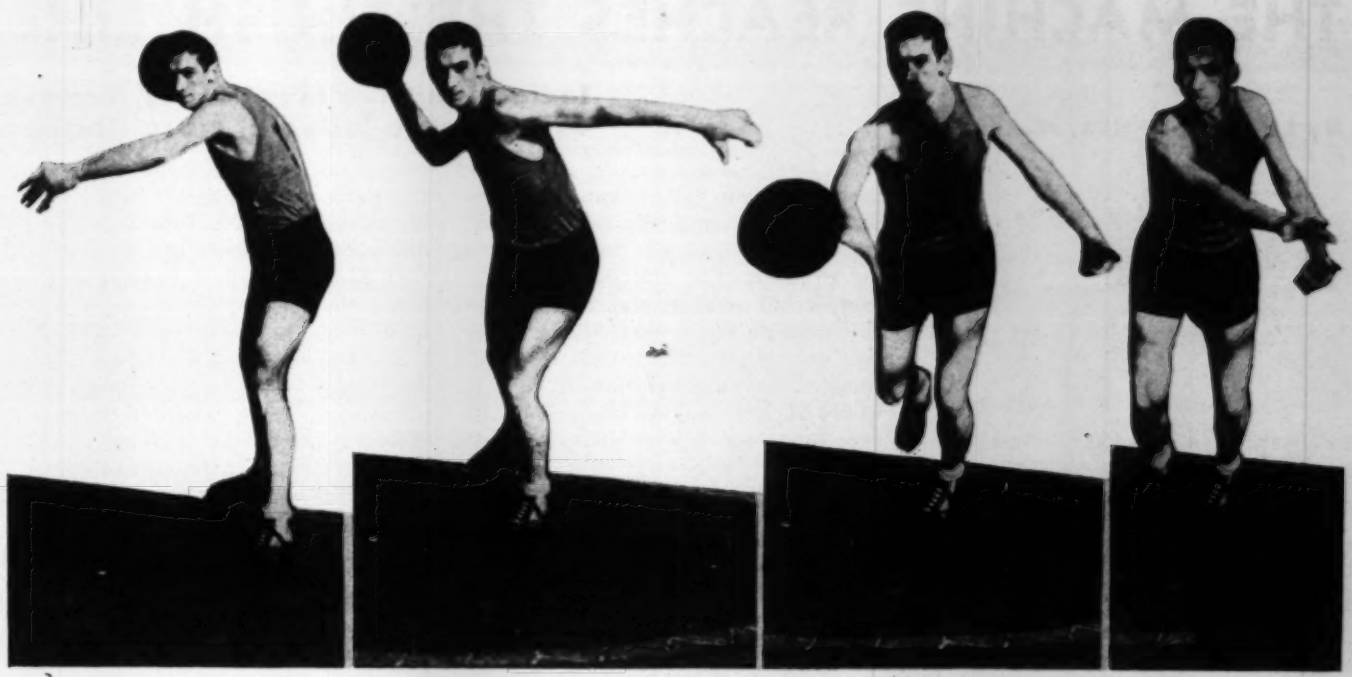
All the other sound passes must be incorporated into the drills, as they seem to fit, so that the players have a fair mastery of all the weapons and the almost intuitive response of using the right pass at the right time. In developing this latter ability the drill will not much help, for it is only under actual scrimmage conditions that the player's capacity for quick decisions can be tested. In the scrimmages, when the player has used the wrong pass, the coach should stop the proceedings instantly, re-set the identical situation, and show the player how he could have gotten better results with another weapon.

Among the other passes which should be acquired are the two-hand flip pass in handing a ball to a teammate cutting by on a pivot, the back bounce pass, used to give the ball to a teammate cutting from the side and going around behind the passer, the hook pass used for passing around the basket and for plays from the center. This pass is made by bringing the arm up over the head, elbow bent very little and made with a quick snap of the arm and wrist, being careful to snap the fingers under the ball as it is released, thus causing it to go straight. If the ball is released off the side of the hand, it will curve. In this pass, the ball is held in one hand, the right as a rule, the left side is turned toward the opponent, the ball is held in the hand with fingers spread and against the wrist. Be sure again to follow through with the arm.

Drill K — Baseball pass — X-5 dribbles past the center line. X-1 breaks out from corner, does a front turn toward the side-line, and cuts fast for the basket. X-5 uses a one-hand baseball pass in getting the ball to X-1 as he cuts for the basket. Good practice in timing the speed and height of this pass. X-5 goes behind X-4. X-1 goes behind X-7.



Along with passing comes the catching of



Long bounce pass, baseball type. Whole body behind pass to supply needed force

the ball. At first and always, insist upon the boy watching the ball till he actually gets it into his hands. If any player develops a fumbling streak, if you watch him you will generally find that he is taking his eye off the ball before he catches it.

Shooting

Putting the ball into the basket is the desideratum supreme, the game being what it is. If the ball could be put into the basket without passing it so painstakingly in prelude, we would not hesitate to abandon the passing. But it does not work out that way, and the goal, most of the time, is usually the result of more or less planned offensive. After taking all the trouble of working the ball into scoring position we mean to go the one final step with a deep appreciation of what we have paid out to get it there. So, we do not allow "hope" shots or one-hand, fancy and assorted acts of legerdemain. We want one of two things in shooting, in the order of their importance: first, a goal; and, second, if denied that, the ball back off the board. The fancy shooter is not only likely to miss the basket, but the very nature of his shot does not allow for adequate "servicing" of the re-bound. He himself is not likely to be in a position to follow-up, and his teammates have not had fair notice of the shot and are therefore, as a rule, in no better position, or state of mental preparedness, than the shooter for following-up.

In shooting goals, we stress the following points: (1) Proper use of arms, wrists, and fingers. (2) The palms of the hands must never touch the ball. It must be held in the fingers. (3) Elbows must be kept close together and never spread. (4) Wrists should be loose, fingers somewhat spread with thumbs in back of the ball. Use thumbs and wrists to give the ball the necessary spin. (5) Confidence and relaxation.

The high school coach has a chance to develop proper form in shooting as he gets a chance at the boys while they are quite young and before they have developed too many bad habits. One thing we insist on is that all the players use the same form in shooting. This is not always practical or possible in college coaching, but it is in high school. I find that the young boys in our grade schools and the boys who play basketball in the school gymnasium classes, but who are unable to make the varsity squads, copy the form of the regular players and, therefore, are much easier to teach when they do become varsity material.

On long shots we stress getting set with feet and knees together, the ball held high and not dipped down lower than the natural drop of the wrists. We take time to adjust the ball in the hands so that the seams are running crosswise, and we direct our aim

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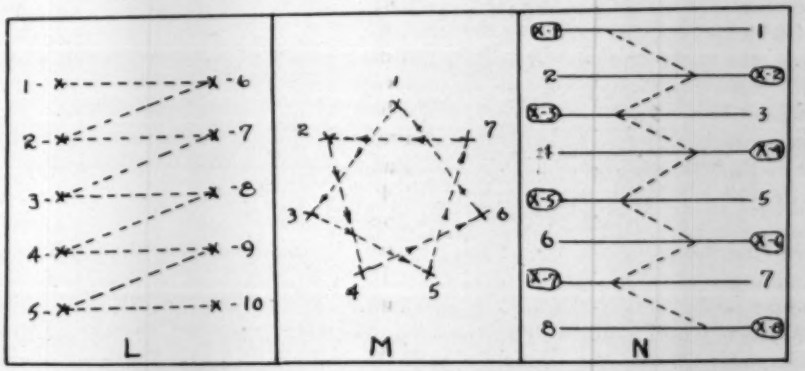


Drill L—Passing Drill—Players line up about ten to twelve feet apart, facing each other. Pass ball back and forth, using all types of passes as directed.

Drill M—Passing Drill—Odd number of players in circle pass to each other, first to the right then to the left, using all types of short passes. Then introduce two balls and have 1 and 6 each take a ball and start passing in the same direction, first to the right, then the left. Speed up by having one ball try to catch the other. Very good drill to develop quick responses and speed in accurately releasing the ball.

Drill N—Passing Drill—Players line up thirty to forty feet apart in two lines, facing each other. X-1 passes to X-2 and cuts across floor to right of X-2. X-2 passes to X-3 and cuts across floor to left of X-3. Caution players not to leave their positions in starting their cut until player who is to make the pass has received the ball.

THE MACHINE REACHES THE FINISH LINE

In track, and now in swimming, it comes as a reliable judge of close finishes

By Leon M. Prince, Jr.

Every coach has been either the beneficiary or the victim of close decisions by judges-at-the-finish on the cinder track or in the swimming pool. It is only human for them to err, and the wonder is that they are able to pick their men as well as they do considering the many factors that militate against eye-and-brain accuracy in judging close races. What these factors are and what inventive genius is doing to substitute the machine for the man as judge, is told here by Mr. Prince, himself the inventor of the chronoboard, a device for judging and timing swimming races, developed at Columbia University with the coöperation of Coach Edward T. Kennedy of the swimming team and Mr. Clarence G. Stone of the physics department.

THE eye as an instrument of precision has not failed; it has merely been outclassed by more precise instruments. In the laboratory the microscope has surpassed it in ability to see minute particles; in the observatory it is the telescope; on the cinder track it is the two-eyed moving-picture camera; in the swimming pool it is the chronoboard.

The two-eyed moving picture camera for track, sponsored by Gustavus T. Kirby, photographs the runners approaching and crossing the finish line, through one lens, and the stop-watch through the other. The watch, housed with the camera on an elevation in line with the finish line, is connected by wire with the starter's gun, the discharge of which starts the watch. When the camera is started as the runners approach the finish line it photographs synchronously frame by frame the dial of the watch and the last stages of the race.

The two-eyed camera has not been used for swimming. Present conditions in indoor pools are not favorable to its use. Even where the lighting would be adequate, there is some question as to whether possible splash of water in close finishes would obscure the hands of the swimmers as they reach out to touch the finish. And where touches would be under water the camera might not always record a clear impression of the finish.

Photo-electric cell methods of "seeing" the finish of track races have been tried without success. While the electric eye, as this device is popularly known, has a greater sensitivity than the human eye, it cannot perform the latter's complexity of functions and for this reason was unable to solve the problem. The electric eye, moreover, would make its record as soon as any part of the runner's body broke into the electric beam which corresponded to the finish line. Thus, it would register as the winner of the race any runner who would be first to thrust out an arm into the beam of light. The rules require that to finish the runner's body, as distinguished from his head, arms, legs, feet or hands, must cross the line.

Movie Camera Causes Revisions In College Track Meet Placings

First Seven Teams Remain Unchanged, but Many Individuals Are Shifted—Fisher Loses N. C. A. A. Hurdle Title to Klopstock

—Variances Found in Hardin's Time Over Timbers.

By The Associated Press.

LOS ANGELES, June 24.—Definite proof that the movie camera is far more accurate than the human eye was given today when National Collegiate A. A. officials made a wholesale revision of the placings in the final races of the N. C. A. A. championships yesterday.

Changes were made in five events, from the blanket finish of the 120-yard high hurdles on down to the quarter-mile, dethroning one champion and shifting the point scores of the teams around with abandon.

The standing of the first seven teams were not changed, but George Fisher, Louisiana State high hurdler, was shorn of his title with the crown being shifted to the head of Sam Klopstock, Stanford.

The photographic timing device, tested and certified before and after the meet, probably stole from Glenn Hardin, Louisiana State, his chance for a world's 220-yard low hurdle record. The camera caught him in 23.16 seconds, while the timers gave him a new world's record at 22.7 seconds.

5 Changes in High Hurdles.

Five changes were made in the 120-yard high barriers after a study of the pictures, which showed that Klopstock won by inches with the fourth-place finisher, Sam Allen of Oklahoma Baptist, less than a foot and a half behind.

On the basis of the screen tests, Amadon Oliver, Miami, was awarded second, and Fisher third; Allen held his fourth place and Ned Bacon, Denison, retained fifth, but Lee Haring, Kansas State Teachers, moved to sixth from seventh, and Forrest Wilson, Texas, was dropped to seventh.

Incidentally, the camera time was 14.83 seconds, as compared to the hand timing of 14.4 seconds.

Considerable shifting also took place in the 100-yard dash. It was decided that instead of placing second, Charles Parsons, Southern California, actually was tied by Hunter Russell, Illinois. The pictures showed Ralph Metcalfe far out in front.

Roy Draper, Southern California, was awarded fourth place in this race, inches ahead of Jimmy Wilson, Stanford, who was shunted to fifth, and Sterling Dupree, Auburn, will get credit for sixth, moving Durward Crooks, Kansas State Teachers, back to last.

Dupree Advances in 220.

The pictures also advanced Dupree a notch in the furlong dash, shifting him from sixth to fifth and shoving Ed Hall, Kansas, back to sixth from fifth. The last two places also were changed in the low barriers with W. H. Bandow, Texas A. and M. getting fifth and Bacon sixth. The judges had selected them the other way around.

In the quarter-mile, Jimmy La Valle, University of California at Los Angeles, was shoved from fifth to seventh, while Ed Ablowich, Southern California, a 1932 Olympic games star, advanced to fifth.

Except for the furlong races which were started in the tunnel, just head timing varied only fractions of seconds. In these races, A. A. Stagg, referee of the meet, said the timers apparently had difficulty catching the flash of the gun in the darkened recess of the start.

Bill Bonthron's great mile race was timed almost to the split second, with Glenn Cunningham, Kansas flier, second in 4 minutes 10.83 seconds. Gene Venzke, Pennsylvania, third, crossed the finish at 4:15.38.

Cunningham, who went unpaced in the half, was caught by the camera in 1:53, as compared with Charles Hornbostel's victory at 1:53.9.

The revised point standing:

Stanford	23	Nebraska	5
So. California	22	Kansas	4
Louisiana St.	21	Pennsylvania	4
Marquette	20	Washington St.	3
Indiana	19	Texas	3
Penn. State	18	Oklahoma	2
Minnesota	16	Kansas St.	2
New York U.	12	Colorado	1
Ohio State	11	Ohio Wesleyan	1
Oregon	10	Notre Dame	1
Michigan	9	West Virginia	1
Southern Methodist	8	Miss. State	1
Duke	7	Dartmouth	1
Princeton	6	Rice Inst.	1
San Diego St.	6	Harvard	1
Auburn	5	Cornell	1
U. S. C. and M.	5	Texas A.	1

Considerable shifting also took place in the 100-yard dash. It was decided that instead of placing second, Charles Parsons, Southern California, actually was tied by Hunter Russell, Illinois. The pictures showed Ralph Metcalfe far out in front.

In swimming races the chronoboard indicates by means of lights within view of all spectators the outcome of the race instantly upon the arrival of the swimmers as they touch to finish, and registers the time of the winner. (See explanation of the chronoboard under cut on opposite page.)

Errors in the human system of timing and judging may be classified as those due to the inherent fallibility of the human organs and those due to the unavoidable presence of external factors. Under the first heading can be listed the lack of rapid coordination of eye and brain, the time delays of motor responses and the limitations of the human optical system; under the second, parallax, physical obstructions, blocking out effects and the underwater touch in swimming.

Timing errors are present in walk-away finishes as well as in dead heats. Errors in judging occur only in close finishes. For this reason the former will be discussed first and the more complicated comments on judging will be reserved for the later paragraphs.

The errors of timing are two in number: (1) The inability of the human system to start the watch coincident with the flash of the pistol; (2) and to stop the watch exactly when the winner arrives at the finish.

The interval of time required for the brain to coordinate an external signal (like the flash of a pistol) into a motor response (like pressing the stem of a stop-watch) has been determined by Cureton and Coe* to be between 2/10 and 4/10 second under ordinary circumstances. Thus we see that timing is always begun after the actual start of the race, by this margin. It is interesting to note that the human system reacts faster to a sound stimulus than to a light stimulus by about 4/100 second (Cureton and Coe); and that it responds faster to a stimulus from a .32 calibre gun than from a .22 calibre.

Of course, reaction times for different individuals vary considerably, depending on their temperament, physical condition and mental attitude. Cureton and Coe* observe that timers whose response reaction is slow make greater total errors in timing than those whose reaction is fast. Reaction times (or responses) also change from meet to meet in the same individual, depending on physical or mental condition. Finally, reaction responses vary in the same individual at the start and finish of the same race.

**An Analysis of the Errors in Stop-watch Timing*: Thomas K. Cureton and David E. Coe; *Research Quarterly*, Vol. IV, No. 2, May, 1933.

This latter effect is brought about by the fact that conditions are changed. At the end of the race the timer has a greater opportunity of anticipating the instant of arrival. It becomes possible for him then to actuate the watch much more nearly coincident with the finish than the start. For this reason the time delays in starting and stopping the watch do not compensate one another, usually causing faster times to be recorded.

Close finishes present the problem of stopping the watch for the contestant who, it develops, is not picked as the winner. In other words, the timer's choice does not always coincide with the judge's picking. Such a mistake comes from standing either in front or behind the finish or by a competitor in a lane nearer the timer blocking out the winner in a more remote lane. The former is an optical phenomenon called *parallax;* the latter is termed *blanketing.*

Finally we come to the problem of actually stopping the watch coincident with the defined act of finishing the race. In track it is the moment when the body crosses the line; in swimming, when the fingers reach the finish wall or rope, as the case may be.

Runners can move at the rate of 10 yards per second or 360 inches per second. This is 3.6 inches per 1/100 second. Swimmers can negotiate about two yards or 72 inches per second. This amounts to 0.72 inch or ¾ inch per 1/100 second. While it is possible to catch a runner to the nearest three or four inches of the instant when he crosses the line, it becomes almost an impossibility to catch a swimmer's touch to ¾ inch. Underwater touches greatly reduce visibility and even an overwater touch may be obscured to some extent by splashing. Hence an error of between 5/100 to 1/10 second or more can be expected from this source in swimming, while the corresponding error in track will seldom amount to more than 2/100 second.†

During the 1932 Olympics the variations between the average time of the human timers and the photographed (electrical) time ranged from plus or minus 3/100 to 13/100 second. On the other hand, Cureton and Coe observed a consistently minus average error of about 3/10 second, of which 2/10 was definitely attributed to physiological delay (reaction time) and the other 1/10 second, chiefly to stopping the watch ahead of time. It would be interesting to see an analysis of the Olympic officials' times in order to see how they compensate for their initial delay in starting.

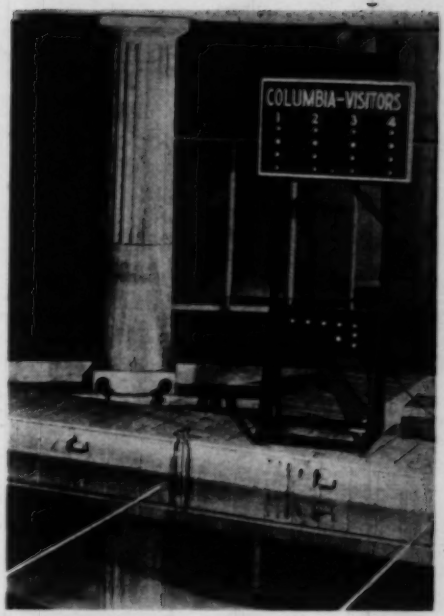
In an ordinarily-timed track meet maximum differences between timers and the average time of all the timers rarely exceed 1/10 second. Frequently all agree. Errors smaller than 1/10 second, however, can only manifest themselves as 1/10 second variations on the face of the watch because of the mechanical construction. Thus, the average of the 1/10 second times of all the timers to the nearest 1/10 second is a very accurate method of establishing records. Incidentally this 1/10 second precision may be taken as an index of the limit of accuracy of the human system. And a very good accuracy it is, too, all things considered.

Individual swimming times, on the other hand vary amongst themselves by 1/10 to 6/10 second for the same race. During the 1933-34 season at Columbia, where the chronoboard was used, discrepancies between the average time of the human timers and the automatic 1/10 second stopwatch which is synchronized with the chronoboard, were never more than 4/10 second. Most of the time a 1/10 second difference or complete agreement was recorded. Such reliability is an indication of the precision of the human organs as instruments of precision under difficult conditions.

But the Kirby two-eyed photographic timing apparatus is accurate to 5/1000 second for the short races and to 1/100 second for the longer ones. This precision is far beyond anything the human system can hope to achieve.

Human timing requires the use of motor responses with its correspondingly large inertia to actuate the stopwatch. In judging the finish this is not the case. Only the time delay of a nervous response from the retina of the eye to the brain is present. For this reason the errors to be expected in judging by the human system arise from entirely different sources than those in timing. They may be classified under three general headings: (1) mental atten- [Concluded on page 20]

†Knight Dunlap, *Science,* Vol. 57:538-9, May 11, 1923.



THE DISPLAY BOARD WHICH FLASHES THE RESULTS: Sixteen lights are arranged in four rows and four columns, the columns corresponding to the swimmer's lanes, the rows to the order of finish. The top row of lights is red, the second row white, the third green, the fourth blue. Thus, the illumination of the white light in the third column would mean that the swimmer in that column finished second. The lower board, or control panel houses the watch and a set of signal lights. With the flash of the gun the watch is started and is stopped when the first man arrives. The signal lamps indicate to the operator the exact stage of the race at a glance, and are essential for resetting the device after each race. They are so arranged that the "ready" light will not operate until the apparatus is reset. The grids are a wire mesh screen extending one foot above the water level and two below. This underwater part is to accommodate the feet in turning so that they cannot become entangled in it. Waves will not trip the grids, but the touch easily operates it. The contact is a highly sensitive switch which throws with 1/1000-inch motion. One switch is located on the end of each lane and is actuated by a metal cable stretched diagonally in back of the grids. In order to keep the swimmers in their proper lanes so that they will finish on the correct grid, a new type of lane marker was developed. It is a solid cork line one inch in diameter extending the length of the pool. A spring provides it with elasticity so that if the swimmer strikes it the lane yields without retarding his progress.

SWIMMER TURNING AGAINST GRID DURING RACE IN THE COLUMBIA POOL. CHRONOBOARD WILL NOT REGISTER THIS CONTACT, FOR THE CURRENT IS NOT TURNED ON UNTIL THE LAST LAP.

New Books on the Sportshelf

Athletic program, Model 1935

RECREATIONAL ATHLETIC ACTIVITIES FOR BOYS AND GIRLS. *An Educational Program Sponsored by the New York State Public High School Athletic Association. Girls' and boys' sections bound separately or in one. 82 pp. in all. Supplied free to member schools. Other schools may purchase copies from the Association secretary, F. R. Wegner, superintendent of schools, Roslyn Heights, N. Y. Either girls' or boys' sections separately, 25 cents; combined sections, 35 cents.*

THESE two reports by the Committees on Boys' Athletics and Girls' Athletics, New York State, are as good an index as anything yet published of the advances school athletics are making under progressive leadership. Here is an outline of what New York State stands for in the administration of girls' and boys' programs. It states the aims and objectives, the methods of insuring success of the program, recommendations of activities for the two main age groups grades 7, 8 and 9; and grades 10, 11 and 12); and recommendations for dealing with major problems.

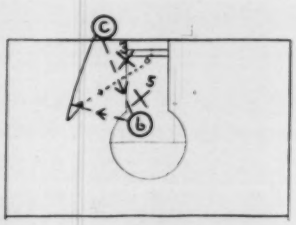
New York State is aiming for a return to the original conception of school sports insofar as it held that the game was "for the players and by the players." Hiram A. Jones, director of physical education, New York State Education Department, says in the foreword: "To place athletics in the hands of the players again, but under the guidance of teachers, has been the New York State goal and policy." The biggest obstacle has been "outsider control," the pernicious influences which had the boys, and frequently the girls, performing as trained seals in inter-school competition conducted only casually under educational auspices.

That New York State has no desire to "give the game back to the boys" in the primary meaning of this abused phrase is evident in the statement of administrative objectives. The pupils are to assist in the planning, management, and officiating of games, under adult supervision. To what extent pupil participation in these activities is permitted depends on local conditions—the stage in the development of the program, the quality of sportsmanship of the teams, the competence and fitness of the students for the job at hand. For instance it is generally found not fitting to have a student referee a basketball game in which his school is playing another school in a formal contest. However, it is considered fitting to have student scorers and timekeepers at the identical contest. At many a second-team interschool game, and at intramural games, student referees, who are neutral in their affiliations or perhaps come from some other school in the district on an "exchange" basis, are not uncommon. Student leadership is used to much better advantage in the less formal, and shall we say "less serious" (meaning "more sporting") phases of the program. It is our opinion, and we are perfectly willing to sink with it, that we have not yet learned how to be really sportsmen during the mad preparation and rush for victory in an "important" interscholastic game. We are much more likely to behave like ladies and gentlemen when the stakes are not so high. Such programs as New York is promoting are doing much to civilize our serious-game behavior.

The administrative objective and policies of an athletic program are stated as follows:

In order to secure the attainment of educational objectives in the fullest degree possible, administrators should *accept the responsibility* and plan to:

1. Discover pupil's individual needs and differentiate individual programs to meet those needs.
2. Group participants in order to establish approximately equal competition.
3. Eliminate material awards, thus preserving natural motivation inherent in the games and sports. The play (participation) should be an enjoyable experience.
4. Provide opportunities for pupils to assist in the planning, management, and officiating in games and sports (under adult supervision).
5. Provide activities in which the standard of performance is such that with reasonable effort, pupils may frequently experience success.
6. Provide for the development of desirable mental and emotional habits and attitudes through the wise adoption of activities, correct methods, and wholesome pupil-teacher relationships.
7. Effectively utilize the time, space,



Below—Out-of-bounds play under the basket. C, with ball out of bounds, leaps high and throws overhead lob pass to teammate, 6, who goes up into the air to receive the pass and make a return pass while still in the air. C, after making his pass, cuts out close to the center of activity around 6, in order to force defensive player 3, who cannot see the return pass, to bump into teammate 5. If defense operates on zone principle, C should cut to any opened area for return pass.

and equipment available for games and sports (peak load).

8. Set up definite safety measures to protect health, eliminate unnecessary hazards, and prevent accidents.
9. Set up standards of achievement and plans for judging and recording progress toward the achievement of educational objectives.
10. Develop and maintain a simple practical system of essential records.
11. Develop habits and attitudes toward recreational activities of a physical nature that will function in later life.
12. Provide opportunities and encouragement for the constant professional growth of teachers in service.
13. Set up definite measures by which the public will accept and appreciate athletics as an effective means of education and thus an important social agency.
14. Recognize and plan for the needs of girls as well as boys with relation to time and facilities.
15. Provide opportunity for employed teachers to engage in and enjoy recreational activities.
16. Recognize that success or failure of the program depends on the selection of qualified leadership.

Equality between competing teams is a goal administrators must ever be striving for. "Eligibility rules have been used as one device to secure this effect," Dr. Jones says. "Though worthy in purpose, they consume time in discussion and usually are ineffectual in securing equality between opponents. While in many cases employed as a blind by those we cannot trust, eligibility rules must be retained."

One of the new eligibility rules recommended by the report would make a boy ineligible who has reached his nineteenth birthday. It is doubtful, at this time, that the New York membership will convert this recommendation into law.

The report suggests activities that are suitable for girls and boys of junior and senior high school ages, listing them according to type, according to season and according to their recreational value in later life. With the permission of the Association secretary, F. R. Wegner, we reprint the first and the third of these classifications:

SUGGESTED ACTIVITIES FOR BOYS

Grades 7, 8, 9

INDIVIDUAL	TEAM	COMBATIVE
Bicyling	*Low Organization*	Boxing
Boating	Newcomb	Wrestling
Hiking and campcraft	Tennikoit	
Golf	Modified soccer	
Handball	Nine court basketball	
Coasting	Pin ball	
Horseshoes	Bee ball	
Horseback riding	Long ball	
Paddle tennis	Bat ball	
Ping Pong	*High Organization*	
Skating	Baseball (soft ball)	
a. Roller	Basketball	
b. Ice	a. Foul shooting	
Shuffleboard	Field hockey	
Skiing	Indoor ball	
Swimming and diving	Track and field	
Tennis	Volley ball	
	Indoor track	
	Soccer	
	Touch football	

Grades 10, 11 and 12

INDIVIDUAL	TEAM	COMBATIVE
Archery	*Low Organization*	Boxing
Badminton	Tennikoit	Wrestling
Bicycling	Modified soccer	Fencing
Boating	Touch football	
Bowling	Volley ball	
Camping	Soft ball	
Coasting	Bee ball	
Fishing	Field ball	
a. Fly casting	Pin ball	
b. Plug "	Hand hockey	
Golf	Scrimmage ball	
Handball	*High Organization*	
Hiking	Baseball	
Hunting	Basketball	
Horseshoes	a. Foul shooting	
Horseback riding	Track and field	
Paddle tennis	Cross country	
Ping pong	Cricket	
Rifle shooting	Football	
Skating	Ice hockey	
a. Ice	Indoor baseball	
b. Roller	Lacrosse	
Shuffleboard	Polo	
Skiing	Soccer	
Squash	Speedball	
Swimming and diving	Touch football	
Tennis	Rugby	
Tobogganing	Water basketball	
Water sports	Water polo	

SUGGESTED ACTIVITIES FOR JUNIOR AND SENIOR HIGH SCHOOL BOYS LISTED ACCORDING TO RECREATIONAL VALUE IN LATER LIFE

Maximum Values

Swimming and diving	Soft ball
Tennis	Archery
Golf	Horseshoes
Handball	Squash
Volleyball	Hiking and campcraft
Winter sports	Water sports
Bowling	Badminton
Horseback riding	Hunting and fishing
Shuffleboard	Ping pong
Deck tennis	Fencing
Boating	

Minimum Values

Boxing	Track and field
Wrestling	Basketball
Speedball	Baseball
Football	Soccer
Ice hockey	Lacrosse

SUGGESTED ACTIVITIES FOR GIRLS

(7th, 8th, 9th Grades)

Individual and Couple Activities	*Group Games of Low Organization*
Duck pin bowling	Captain ball
Hiking and campcraft	Dodgeball
Paddle tennis	Endball
Ping pong	One-old cat
Swimming	Tennikoit (deck tennis)
Tennis	
Tether ball	
Winter sports	
Dancing (social, tap, and clog, etc.)	

Group Games of High Organization

Giant volley ball
Hit pin baseball
Baseball (12" ball)
Kick baseball
Newcomb
Nine court basketball

(10th, 11th, 12th Grades)

Individual and Couple Activities	*Group Games of Low Organization*
Archery	Fist or punch ball
*Badminton	One-old cat
***Battle board tennis	Tennikoit (deck tennis)
Duck pin bowling	
Golf	
Hand ball	
Hiking and campcraft	
Horseback riding	
Horse shoes	*Group Games of High Organization*
Paddle tennis	
Ping pong	Speedball
Quoits	Volley ball
Shuffleboard	Field hockey
Squash	Baseball (12" ball)
Swimming	Basketball
Tennis	
Water sports	
Winter sports	
Dancing (social, tap, & clog)	

SUGGESTED ACTIVITIES FOR GIRLS LISTED ACCORDING TO RECREATIONAL VALUE IN CARRY-OVER FOR LEISURE IN LATER LIFE

Junior High Activities

Most Valuable	*Less Valuable*	*Least Valuable*
Hiking and campcraft	Duck pin bowling	Baseball
Paddle tennis	Tether ball	Captain ball
Ping pong		Dodgeball
Swimming		End ball
Tennikoit (deck tennis)		Giant volley ball
Tennis		Hit pin ball
Winter sports		Kick baseball
		Newcomb
		Nine court basketball
		One-old cat

Senior High Activities

Most Valuable	*Less Valuable*	*Least Valuable*
Archery	Badminton	Baseball
Golf	Duck pin bowling	Basketball
Hiking and campcraft	Quoits	Field hockey
Horseback riding	Volley ball	Fist or punch ball
Paddle tennis		Handball
Ping pong		One-old cat
Shuffleboard		Speedball
Swimming		Squash
Tennikoit (deck tennis)		
Tennis		
Water sports		
Winter sports		

THE MECHANICS OF BASKET SHOOTING

By H. C. Carlson, M. D.

Some factors in the projection and direction of various types of shots

AN analysis of the art of basket shooting includes a great many factors. Too many superficial opinions are taken as absolute facts. When opinions are backed up by actual experimentation we shall have a better chance of expressing the truth. There are various anomalies in nomenclature which complicate this discussion. We hear of finger shots, wrist shots, and chest shots. The first two suggest the method of the shot. The chest shot gives us the idea of where the shot is started. The objection to the terms finger shot and wrist shot is that they convey the idea that the ball is projected by the fingers or the wrists. Such is not the case, and an argument is herewith precipitated. A person cannot project a basketball ten feet in the air with either his fingers or his wrists without the help of other muscles. It is true that some of the fingers or the thumbs may be the last part of the body to touch the ball. In this case we can then give them credit or discredit for the *direction* of the ball.

Projection and direction become the theme of this paper. Spin may be a part of either projection or direction, or it may be lacking altogether. If a basketball is projected the correct distance and in the correct direction the goal is made. The factors of correct projection are most important. The elements or combinations that give correct projection and direction are the bases of a discussion which must necessarily be treated in a general way in this limited space. Projection, direction, and their child, spin, will be discussed in the order of their possible relative importance.

Projection may come from one part of the body, or from a combination of action in practically the entire body. The senses, reflexes, balance coordination and other details are not salient in this paper. The most common action involved in shooting is extension of the forearm from the elbow. With greater distance demands, there is added action, chiefly by extension at the knee and ankle joints. There are other body actions that enhance the extension at the elbow, and one of these may be the action of the back muscles in conjunction with action at the hip.

In Fig. 1 the shooter is going to get his projection by flexing the forearm at the elbows. If he were to shoot from a greater distance there would be more preliminary flexion or bending at the knees and ankles. In this latter case projection would be increased by extension or straightening at the knees and ankles as well as in the bending at the elbows.

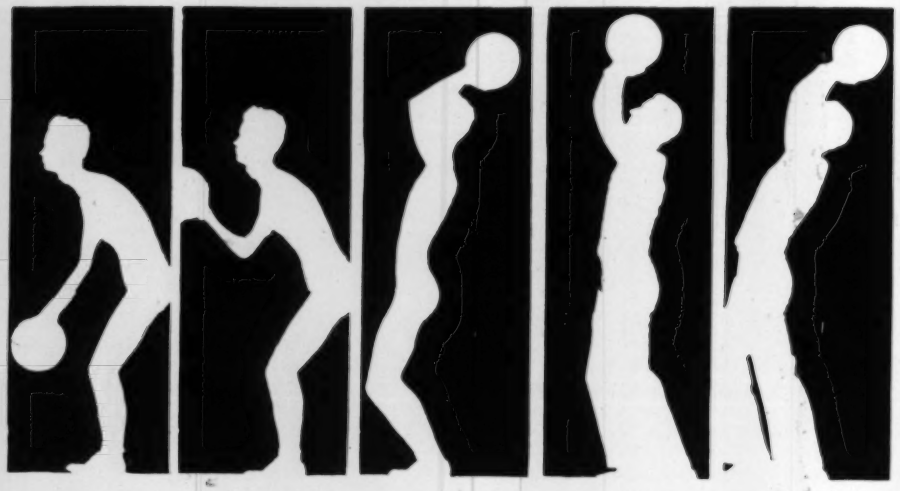


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

Fig. 2 shows that projection will come from extension of the forearm. There is a preliminary flexion or bending at the elbows. With a short distance to shoot, sufficient projection could come from extending the forearms. When greater demands are made, other parts of the body are called into play and there is flexion or bending at other parts, chiefly hips, knees, and ankles.

Fig. 3 shows a shot that is not as common as it might be, for various reasons. The mechanics of all joints mentioned in Fig. 2 are exactly the same in Fig. 3. The only difference in the activity is that the spine and head operate oppositely from the preceding picture. The head and shoulders are forward at the finish of this shot, whereas in the preceding two shots the head and shoulders would be back at the finish of the shot.

Fig. 4 shows a shot that is fairly common. Most of the projection power comes from extension at the knees and ankles. There is supplementary action with less extension at the elbows in this shot than in the preceding shots.

Fig. 5 shows the start of a shot that receives its most power from a flexion or bending forward of the body after the initial bending backward. The power on this projection can be enhanced by extension of the arms above, as well as extension at the knees and ankles.

The projection in the shots described takes no cognizance of the wrist or fingers. Their work may be nil, or only a slight part of projection. They may be factors in the transition from projection to direction. Shots can be made without any movement in the wrist joint. Shots may be made without any movement within the finger joints. But it is likely that most shots show some movement in the wrist or finger joints or both. This is to emphasize the functions of the fingers to hold and direct the ball. When the right hand leaves the ball first, the natural thing to expect is that the ball will go too much to the right, if the hands have the same relative hold on the ball. Too much projection is then given by the left hand, and this interferes with the direction.

The last contacts are the determining factors in direction. The fingers and thumbs of each hand can hardly leave the ball simultaneously. This would be the clue to reduce to a minimum the last contacts. The fewer number of contacts should be conducive to greater coordination and therefore greater accuracy. This will put the burden of direction upon the fingers and the work of projection upon other parts of the body.

The method of last contacts determines the spin of the ball. Many arguments have been presented pro and con regarding spin. If a spin on the back part of the ring will pull a ball into the basket, then the same kind of spin on the front of the ring will pull the ball out of the basket. The mechanics of the spin are in line with this paper.

In Fig. 1 the ball may be delivered with a spin toward the shooter. In

this case the thumb and the first two fingers are the last contacts with the ball. A shot without spin can be had if the little finger and its two adjacent fingers are the last in contact. Spin away from the shooter can be had if the ball is allowed to roll off the latter combination, with a little jerk.

In Fig. 2 spin toward the shooter is given by the last contact with the thumb combination. The wrist factor can cause a dead ball (one without spin) to be projected.

In Figs. 3 and 5 the tendency is to give no spin; the last contacts would be the thumb combination. In Fig. 4 the spin is toward the shooter, with the thumb combination as the last contact.

This paper has dealt only with the mechanics of projecting and directing the ball. It does not deal with the various senses involved. It may help the individual to analyze his shooting. The errors of shooting may be in projection or direction and one can readily name the error in any shot.

■

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[Continued from page 15]

tion; (2) optical effects; (3) physical obstructions.

Before going into the details of these three factors, let us first introduce a term which more accurately specifies the duty of the judge than the verb *judge*. It is *differentiate*. In other words, the judge is really called upon to differentiate a sequence of events, each one of which is the arrival of a competitor at the finish. Thus, to properly judge a close finish is to differentiate a sequence of events occurring within a short interval of time (1/100 to 1/10 second or more). With this in mind the reader will be better able to interpret the subsequent discussion in the light of precision measurement.

By *mental attention* is meant concentration on the race in progress from the point of view of differentiator rather than that of a spectator. The judge must forego the pleasure of just watching the competitors in the last few yards of close finishes and strain his nervous system so that he will be acutely aware of the impending events. In this he is called upon to pass judgment on something he can see only for a fleeting instant. Such snap decisions call for rapid coordination of eye and brain. This can only be obtained with a brain cleared for action.

As with the delay of motor responses in timing, this nervous response varies in acuteness from individual to individual. For each judge there exists a limit as to the closeness of the finish beyond which he is no longer able to assign an accurate interpretation. This limit approaches the precision of the automatic units only in those rare individuals whose prowess in this regard is abnormally high. Most judges will begin to give inaccurate decisions long before they begin to approach the accuracy of the automatic judge.

Now, lack of rapid eye-brain coordination coupled with psychological prejudices form the basis for an interpretation of the cause of disagreement between judges in calling a close finish in either sport. It is that the presence of these two features so confuse the judge's mind that he is unable to accurately determine whether what he thinks he saw for a fleeting instant is really the true picture. In this unhappy predicament he is further confronted with the question of whether or not what he *thinks* he saw agrees with what the other judges (think they) saw. Such a state of mind comes about from not having been mentally alert at the proper instant. A really fine judge does not err in this regard as a rule but is handicapped in limiting cases by conditions beyond his control.

Just what constitutes the limiting case is a moot question. The case where three or more competitors arrive at the finish less than a foot apart might be the limit. At any rate, somewhere the limit comes, and when it does, we find it not rare to see such errors as the first, second and third place judges picking the same man.

Beside clearing the brain for action it is just as important in obtaining accurate results to clear the eyes. They should be trained on the finish line (not on the competitors) for some time preceding the end of the race so that they can become accustomed to receiving an impression along that line. If, however, they are focused too long they will tire and be unable to perform with maximum efficiency. It is advisable, although not generally practised, to shield the eyes with the hand, so as to exclude all extraneous fields. Since most people favor one eye, it is also advisable to close the weaker one and sight along the finish with the other. These precautions will ensure obtaining maximum efficiency with the eyes under a given set of conditions.

Two more points under the heading of optical effects which cause errors in differentiating are worth mentioning. One is parallax, the other the angle which the eye subtends at the finish line in swimming.

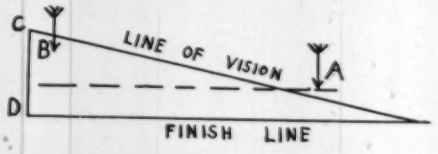

Fig. 1

Parallax is that optical phenomenon which can cause the judge to see one object in front of the other when the reverse is actually so. The accompanying diagram (Fig. 1) shows that this happens when the eye is not exactly on the finish line.

CD is the horizontal displacement of the eye from the finish line.

In this instance the judge will see B ahead of A, when A is really nearer the finish line than B. This error is common to timing as well as judging.

Considerable attention has been given to the confusion caused in judging and timing by looking over somebody's shoulder. In an effort to obviate this disturbance, track officials have constructed small judging stands. These are arranged like steps so that several judges can view the finish line over the head of the one in front without interference.

When the judging stands are not used a runner nearer the judges may eclipse the view of another in a more remote lane and in this way interfere with the accurate judgment of the finish. This effect is responsible for elevating the camera in the photographic apparatus and constitutes the major source of trouble in this unit.

By elevating the judges above their normal line of vision a vertical displacement of the eye is created which introduces another source of error. A similar condition is always present in swimming meets. It is best illustrated by a drawing (Fig. 2):

Due to the vertical displacement, the eye must subtend a large angle. Let XY represent the finish line and K the height of the eye above the tape in track or the water level in swimming. In this position, in order to see the men in the nearest and farthest lanes at the same time angle-1

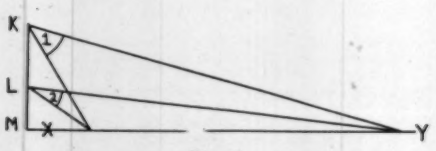

Fig. 2

must be subtended. In position *L*, which corresponds to a kneeling position in swimming, angle-2 is subtended. Obviously, from the geometry of the system, angle-2 is smaller than angle-1. This means that the eye is less strained in the kneeling position than in the standing.

Position *M* corresponds to the case where the eye is on the same level with the tape or the water. Here zero angle is subtended and least strain imposed on the eye. Such a condition is rarely found in track and is impossible in swimming.

What happens when the eye must subtend too large an angle is that it "jumps" from one object to another, being unable to include all of the objects in one position of the eye. Now, according to Luckeisch*, jumping requires an appreciable time interval. From data obtained from several thousands of observations he has been able to determine that the minimum "fixational pause" ranges from 7/100 to 25/100 second with an average minimum jump time of 15/100 second.

Theoretically, then, if the judge of a swimming event is called upon to make a close decision when a large visual angle must be subtended in order to see all the competitors, and his eye does jump, he cannot be held responsible for an accuracy of better than one foot (15x¾"). But such conditions ordinarily obtain in Intercollegiate and scholastic swimming circles with the result that the judge's decision is very definitely influenced, depending upon which contestant he was looking at before his eye jumped.

Many conflicting decisions in swimming are readily traceable to this source of error. As for track finishes they are fortunate in being so physically arranged that the visual angle to be subtended is relatively small with the result that the eye may be strained more than usual in certain cases but will never have to jump.

Illumination, size of object and the contrast between the object and its background are also directly proportional to lessening the strain on the eye. Of these only poor illumination in the indoor pool causes any marked decrease in the efficiency of the visual sense. Occasional disturbing effects are obtained in the background of a track finish but such instances are insignificant when compared to the decreased eye efficiency brought about by poorly lighted pools.

In swimming an error of the first order is introduced by the underwater touch. Because of the difficulty of seeing this type of stroke, judges have come to set an unfair premium on the lucky overwater touch. This refusal to generally accept the underwater touch in close finishes accounts for an error of one-half stroke.

Throughout this discussion it has been tacitly assumed that the automatic units are absolutely accurate. But this it not so. The two-eyed camera fails to differentiate two men closer than the width of the chest when a blocking-out effect occurs. Dividing by two we arrive at a judging error for the camera of about three inches. In the swimming unit, because of the arrangement of the grids in front of the finish line, a corresponding error of two inches is obtained.

*M. Luckeisch and Frank K. Moss, *Seeing*. The Williams and Wilkins Co., 1931, Baltimore.

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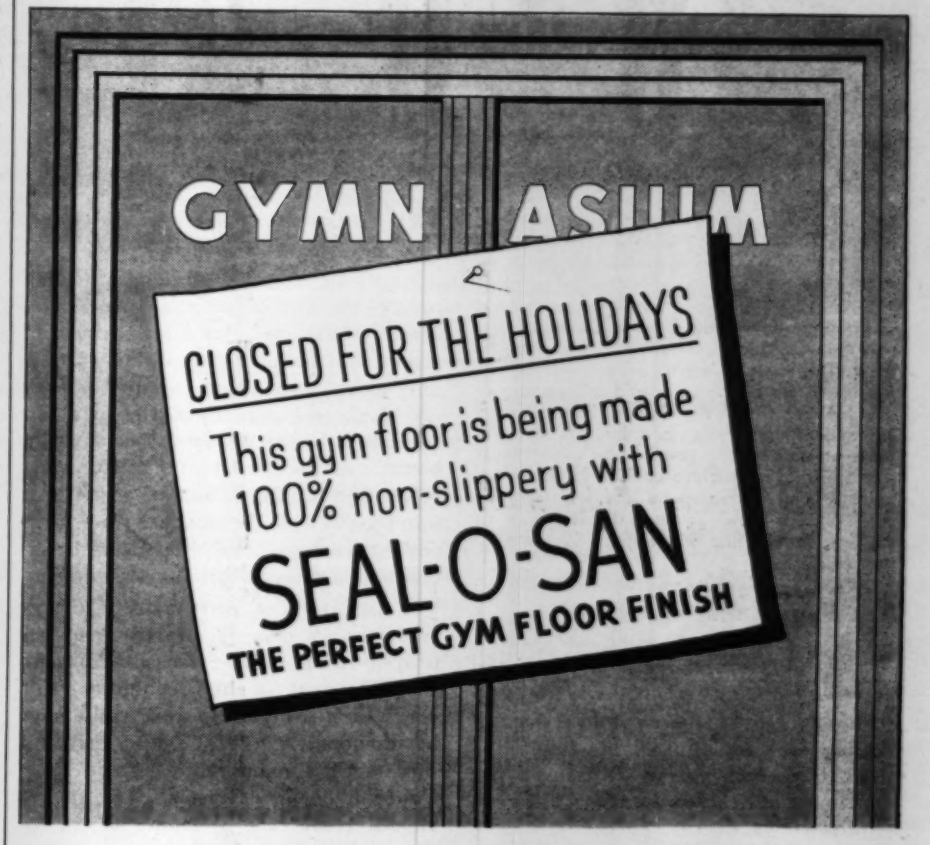
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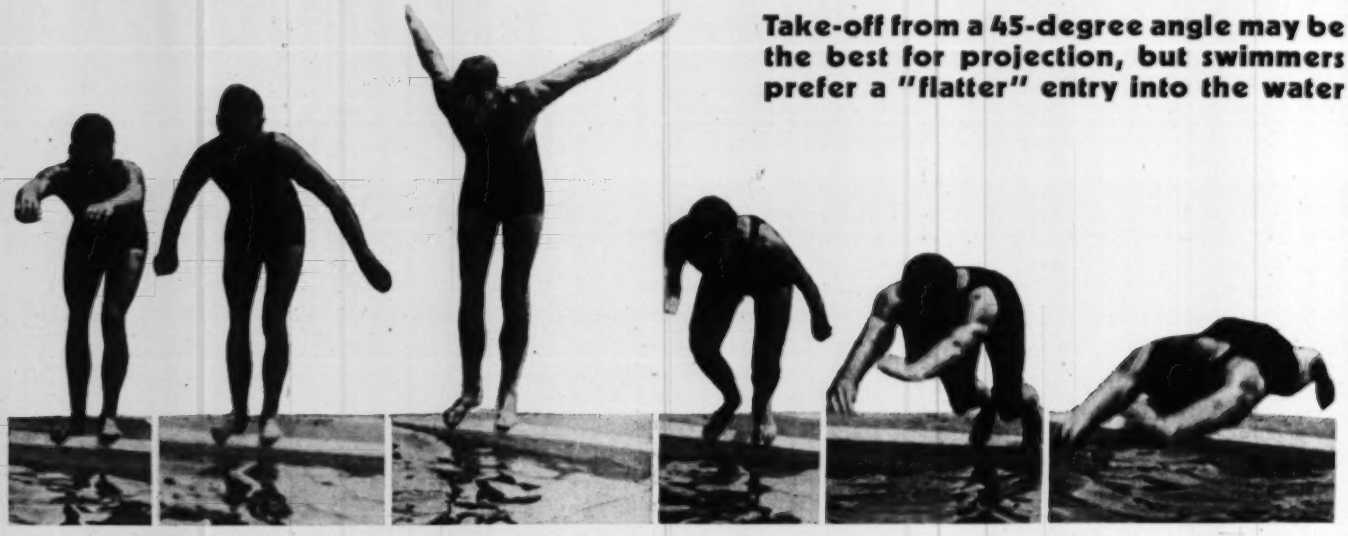
THE RACING DIVE

By Albert W. Gray



Take-off from a 45-degree angle may be the best for projection, but swimmers prefer a "flatter" entry into the water

This is the first of a series of articles on competitive swimming by the coach of the New Haven, Conn., High School swimming team. Mr. Gray's second article will be on the free style racing turn, and will appear in the January Scholastic Coach. Some of the recommendations advanced by Mr. Gray in these articles are the result of his experiments with the moving picture camera in determining the comparative speed and form of various methods. Drawings made directly from his moving picture film will appear in some of the articles.

"AND upon the signal

"1. 'Get on your marks,' the contestants shall step to the starting mark and assume any starting position, provided they hold a steady balance for an appreciable length of time. When the starter is assured the swimmers are steady he starts the race with the

"2. Pistol shot."

Any competitor leaving his mark before the pistol has been discharged shall be charged with a false start. Three false starts by any contestant shall disqualify him.

Any consideration of the racing dive must start with the above—the official rule governing the start of a race, as published in the *Intercollegiate Swimming Guide,* which contains the rules generally accepted by both colleges and high schools.

"When the *starter* is assured the swimmers are steady . . ." reads the written rule. For the swimmer who would make the most of his opportunity, the *unwritten* rule is to assure *himself* that he is steady—calm and ready. To be perfectly calm, at ease and at the same time ready to leave the mark instantly upon the firing of the pistol, is an enviable accomplishment. The required poise, balance and relaxation (the product of a state of mind as well as of physical efficiency) comes, as does everything that is exceptional, through practise.

Poise and the "mental set" derive from the swimmer's awareness of the proper thing to do—his confidence in the efficiency of his technique. The coach helps build up this confidence by demonstrating the superiority of one method over the other *in relation to each swimmer.* The coach should treat each swimmer as an individual, and apply the generally accepted technique to the individual only as far as that individual, after a fair trial, responds favorably to it. The racing dive is one department of competitive swimming where the coach must allow considerable margin for individual differences. Experimentation with each individual swimmer over a restricted period is the procedure most likely to bring the best out of the individual. By approaching the problem of improving each swimmer in this way, the coach also contributes to the development of the swimmer's confidence in himself, which is so important if he is to do well as a competitor.

The most efficient racing dive for each swimmer is that dive which carries him the furthest distance through the air in the shortest time, and which lands him in the water in the best position for continuing on at his maximum swimming speed. The principal factors governing this performance are: (1) force (leg drive in taking off, with contributory arm action), (2) angle of force, (3) maintenance of body position in the flight through the air, for an efficient entry into the water.

The force of the take-off is determined by the use the swimmer makes of the "coiled up" energy in his legs as he awaits the pistol shot and as he applies that energy with the crack of the gun. The swimmer's preliminary motions before the starter says "Get on your marks" and the motions the swimmer makes once on the mark, are largely a matter of individual choice. At the command "Get on your marks" the standard response is for the swimmer to step quickly to the starting edge, his toes slightly over the edge and turned down to grip the edge; body bent forward at the waist, head up, eyes looking forward, arms held back in readiness for the forward double arm-whip at the crack of the gun; legs bent at the knees at a degree which the particular swimmer has found to provide him with the most force, as far as he can tell. There is no advantage to be gained by allowing the body to begin falling forward in anticipation of the pistol shot. In swaying forward the swimmer is within his legal rights, as long as his feet are still in contact with the mark, but what few inches he may gain in distance he will probably lose in take-off force. While the swimmer is within his rights in swaying forward, the rules specifically state that the starter must not fire the pistol until he "is assured the swimmers are steady."

"The starter should not give the swimmers a chance to sway forward," said Edward T. Kennedy, editor of the *Intercollegiate Swimming Guide,* Columbia University coach, and starter in many of the national annual meets. "After the command 'get on

*The National Collegiate A.A. *Intercollegiate and Interscholastic Swimming Guide,* the 1935 edition of which has just been issued (American Sports Publishing Co., New York, 25 cents) contains a special section of interscholastic swimming rules. This section is composed of four exceptions to the intercollegiate rules: Rule I, special order of events for secondary schools; Rule III, list of events in which national interscholastic records will be recognized; Rule V, restriction confining a schoolboy contestant to two events, relay included as an event; Rule XI, diving program limited to four compulsory and four optional dives.

your marks,' the starter should fire the pistol the instant the line of swimmers appears steady to him. Of course, if he notes a swaying figure in the line he should withhold the gun, and if he has already fired it, he should fire a quick second shot to recall the start."

With the crack of the pistol, the quick get-away is accomplished by vigorously straightening the body and leg muscles as the arms are whipped forward. The body must be very definitely stretched while traveling through the air; the head should be kept up, eyes looking forward, until the body begins to drop. The arms and hands should be kept straight out, slightly above the head. As the body begins to drop, lower the head and look at the water so as to determine when the body will strike. As the body strikes the water deliver a sharp, short blow with the outstretched hands, palms down; at the same time strike with one leg to keep from sinking too deep. That leg may be kept slightly higher than the other as the body falls toward the water, in order to be in readiness for the first beat in the water. In sprint stroking the striking of the water with the hands and one foot will actually be a starting on the stroke. In sprints there is practically no glide allowed. The stroke should be started as soon as possible in the water.

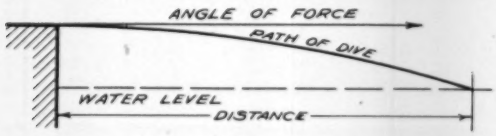


FIGURE 1.

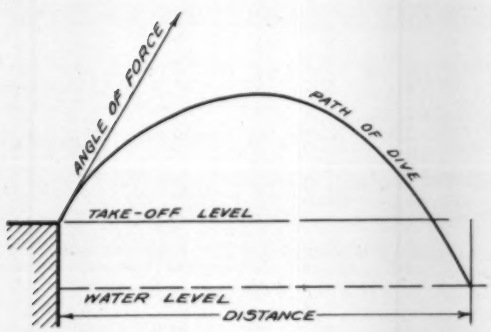


FIGURE 2.

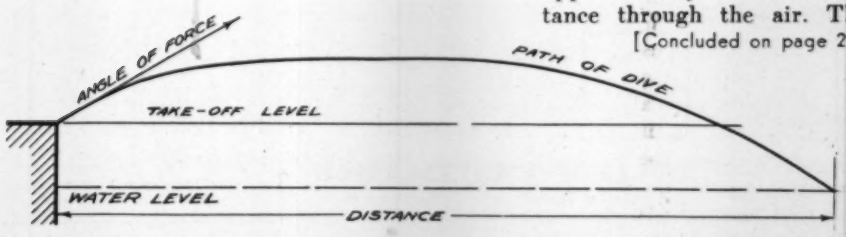


FIGURE 3.

At what angle should the swimmer project his body into the air in taking off? Here is where there is a considerable difference of opinion. A projectile fired from a gun at an angle of 45° will travel a greater distance than if fired at any other angle. If the human body were as regular and mechanical in its movements as the gun, this would probably be the recommended angle for the racing dive. Thomas K. Cureton, of Springfield College, has shown by experiments that 45° is the best angle for putting the shot.

In the racing dive, however, the entry into the water must be taken into consideration. A dive at a 45° angle will send the swimmer into the water at a wider angle than a dive at a 20° angle; that is, the 20° angle dive will be a shallower dive.

There is a considerable difference of opinion as to the desirability of the shallow "skimming" plunge over the deeper dive which follows the 30° to 40° take-off. Johnny Weissmuller was a "skimmer," and hit about as flat as is possible. He sacrificed distance through the air in order to get into the water early and at the smaller angle. It was his temperament to want to get going in the water as soon as possible. Weissmuller had tremendous power in his legs and knew how to "coil it up" to supply the force for his take-off. His force, projected at a 15° angle, sent him out as far as many of his rivals who took off at a bigger angle. Of course, that same force, applied at a 35° angle, would have sent Weissmuller out that much farther. The point is, that he did not want to be in the air so long, and probably did not consider the difference worth bothering about. Here, again, is a case where the decision should be left to the individual, after he has given other procedures a trial.

The accompanying Figures 1, 2 and 3, are hypothetical cases, showing the relative distances a swimmer would go through the air if he applied the same force to each of three dives at a different angle. The two extremes (Fig. 1 and Fig. 2) would carry him approximately the same distance through the air. The

[Concluded on page 25]

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Here Below

[Continued from page 5]

socks on the jaw. Many of them are exceedingly interesting, and showed originality. Besides the bodily punishment yells, there were those that dealt with vegetables, animals, pastries and pies, Oh min, hi-dee-hi-dee-ho, babies in high chairs, the literary classics, baby buggies, breakfast foods and movie stars Our favorite yell of the lot, but which won no prize, comes from Edna Giroux, Raub, Indiana, H. S.—

Onions! Carrots! Cabbage! Beets!
Look at all those empty seats.
Hit the crowd, you lazy fellers;
Cop the coin, you ticket sellers.
Shakespeare! Swinburne! Shelley!
Keats!
Swell those tiny gate receipts!

Commercialism, we call it, and like it thus frankly stated.

From "Tuffy" Puckett (who, incidentally, wins our prize for a name pleasant in sound and rhythm) comes the best of the fighting vegetable yells (Altoona, Kansas, H.S.)—

We fight like a fighting man,
We kill all the Wimpegs we can;
We're strong to the finish
'Cause we eat our spinach,
And make all the touchdowns we can.

Of the assault and battery yells the following prize winner, by Wilfred Mork of Souris, North Dakota, H.S., made us tremble with the thought of ever having to oppose a Souris student—

Ride 'em on the collar button,
Kick 'em in the jaw;
Drag 'em through the cemetery,
Rah, Rah, Rah.

An improvement for readers, rather than listeners, would be to change the last letter in the words of the last line to "w."

More sanguinary still was the yell on decapitation, by Lurene Spindler of Roosevelt Junior H.S. of Beloit, Wisconsin—

Come on, Sullivan!
Don' walk and stand and pace!
Whack off their heads
And throw 'em in their face!

Of the very raw yells, none exceeded this red-blooded composition, from the point of view of pictorial beauty (by Howard Mott, Manistique, Mich., H.S.)—

Cut his cheek!
Slash his jaw!
Make his face,
Raw! Raw! Raw!

Less raw, but equally bloody, is this tone-poem by George Peterchalk, Portage, Penna., H.S.—

Rip! Roar! Blood and Gore,
Up against eleven more,
Boys we've never seen before
But we're going to win once more.
Rah! Rah! Rah!

Modesty rears its ugly head in these restrained offerings, the first by Noma Strong, Derby, Conn., H.S.; and second by Lillian Collins, Pulaski, Tenn.—

Sometimes we win
Sometimes we lose
But we have a smile
We always use
Derby! Derby! Derby!

Hocus, Pocus, Dominocus!
Wicked words that almost choke us!
We're the winners sweet and shy,
Pride and joy of Pulaski High.

Deep disdain is the keynote of these two yells, in which Harvard is made the goat, but any favorite rival will do. It is interesting that both writers, one from South Dakota and the other from Pennsylvania, picked on poor Harvard. By Joseph Pirilla, McKees Rocks, Penna.—

Cigarettes! Cigarettes!
Butts! Butts! Butts!
Harvard! Harvard!
Nuts! Nuts! Nuts!

By Charlotte Nearman, Jefferson, S. D.—

Go get the baby buggy,
Go get the hearse,
Drive out Harvard
Before they get worse.

The repeal of the 18th Amendment has probably inspired these alcoholic gurglings, the first by Freddie Thomas of Booker T. Washington H.S., Norfolk, Va., the second by John Lomks, Froid, Montana, H.S.—

Baby loves wheat bread!
Papa loves gin!
This is the game
We're going to win.

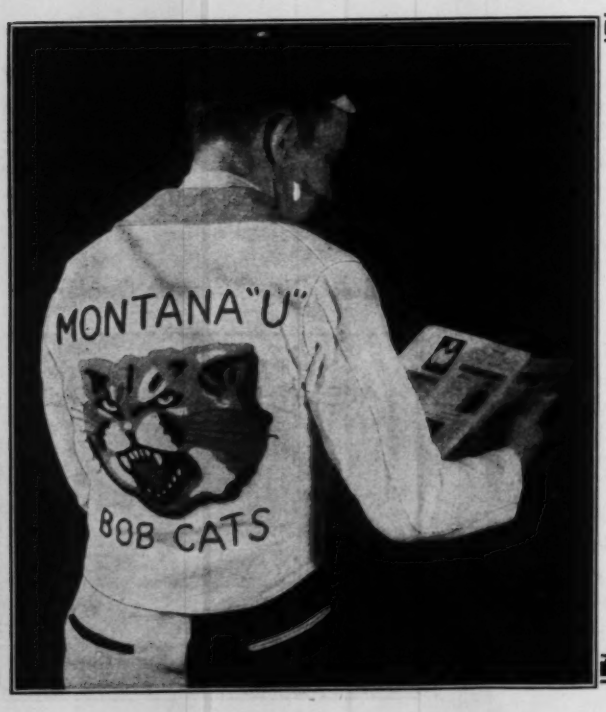
Sauerkraut, dumplings,
Pretzels and beer,
Come on, Froid,
We're all here.

A more substantial diet is offered by Andy Senkevich of Ambridge, Penna., in this requiem—

Oatmeal, Cornmeal,
Shredded Wheat, Mush;
Michigan is dying
Everybody hush—
oo oooooOOO
Chicago, Chicago, Chicago

The final note is a plea for pure Fight, by Thelma Ward, Accoville, W. Va.—

Yea Blue!
Yea White!
Yea Man
Let's fight!



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Hold the floor, raise the roof,
Bulldogs, Bulldogs, woof, woof, woof!
Tigers, Tigers, take the ground,
Twist those doggies' ears around,
And then send 'em to the pound,
Till their senses they have found!
Yeah! Tigers! Show your stuff!

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New Magazine in Phys. Ed. Field

THE idea of publishing a magazine containing in condensed form articles that have appeared previously in print, has been carried out in a new field by the *Physical Education, Health and Recreation Digest,* which made its bow October first.

Published from 29 Exeter Street, Boston, under the editorship of Boston University people—Charles D. Giauque and Frederick Rand Rogers—the *Digest* promises to appear monthly from September to June, at fifteen cents per copy, one dollar per season. The advisory board includes such famed physical educators as McCloy of Iowa State, Nash of New York University, Williams of Teachers College, Columbia; Neilson of Stanford, Oberteuffer of Ohio State.

The *Digest* appears in convenient pocket size, is printed in large, well spaced type, and carries no illustrations and no advertisements. The inaugural issue contained forty pages, representing twenty-three articles. The second issue, November, contained twenty-seven articles.

Among the articles in the first issue are: "Why Exercise?" by Arthur H. Steinhaus of George Williams College, from *The Journal of Health and Physical Education;* "Degrees, Prizes and Honors," by A. Lawrence Lowell, from *The Harvard Teachers Record;* "A Questionnaire Study of Boys' Health Habits" by M. Donald Adolph, from *High Points* (New York City High Schools); "Heart Patients and Sport Activities," from *The Journal of the American Medical Association;* "Teaching Nutrition to Boys and Girls," by Mary Swartz Rose, from *The Journal of the National Education Association;* "College Careers of High School Athletes and Non-Athletes," by Dorothy Eaton and J. R. Shannon, from *The School Review.*

The November issue included: "New Deals: A Sketch for Physical Education," by Frederick Rand Rogers, from *Health and Recreation Journal,* California; "Analysis of Two Leading Sprinters," by Conrad M. Jennings and Joseph T. Cogdal, from *Athletic Journal*; "The problem of the Overweight Child," by W. A. L. Styles, from *Hygeia*; "First Aid Don'ts," by Norman R. Goldsmith, from *Hygeia*; "Alcohol and Muscular Exercise," from *Journal of the American Medical Association*; "A High School Principal Looks at Health Education," by Henry E. Hein, from *High Points*; "An Atmospheric Dust Recorder," by Willis G. Hazard and Philip Drinker, from *The Journal of Industrial Hygiene*; "Influence of Athletics on Menstruation," by Auguste Hoffman, from *Zeitschrift f. Geburtschülfe u. Gynäkologie*; "College Football and College Endowment," by Arnaud C. Marts, from *School and Society*; "Congress of Medicine Pertaining to Sport," from *Journal of the American Medical Association*; "A Practical Electro-Mechanical Race Timer," by Lyle Welser, from *The Research Quarterly.*

The articles, in their digested form, contain only the essence of the originals.

■

The Racing Dive

[Continued from page 23]

angle shown in Fig. 3 would carry him appreciably farther. Since the body, as usually projected in the racing dive, will travel through the air faster than it can be made to go through the water, it would seem that, for the purpose of speed over that part of the course, the best dive is one taken from the angle shown in Fig. 3. But when an individual does not "feel right" at this angle, as Weissmuller evidently did not, the point of one vantage should be dismissed in favor of the psychological one, unless experiments on the swimmer show that he is mistaken, and that his "feelings" are betraying him.

There is also the matter of manipulating the body at the entry into the water. Some swimmers, who dive off at a 35° angle, can manipulate their entry so that they go but a few inches below the surface of the water, while others are not capable of controlling their submersion to this extent, and therefore prefer to guard against a deep entry by diving off at the smaller angles.

Tests to determine the efficiency of a swimmer's dive can be conducted which will show the distance traveled through the air and the time in the air. The stop watch and the motion picture camera can be utilized in making these tests, though due allowance must be made for error. From a moving picture film, exposed at a known rate of speed, the time of a dive can be determined by counting the frames and dividing that number by the rate the frames travel through the camera per second.

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65% said they would advise all athletes to Junketize all milk before drinking it.

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The Physiology of Athletics

Heart and Circulation, 1

By Peter V. Karpovich, M. D.

This is the first article of a series by Dr. Karpovich on the heart.

THE heart is probably the most abused organ. Its structure, location and function are badly misrepresented. A passionate lover on the stage presses his hands against the spleen or the upper part of the stomach in the belief that he is pressing against his heart. Valentine cards convey the idea that the heart looks like a flattened out radish. And of course the heart is believed to be the seat of emotions. Even the consistency of the heart is supposed to vary with the character of the people: a kind person will have a soft heart and an unkind person will have a hard one.

Certainly all the misconceptions had their reasons for originating, and at present they serve mainly as useful symbols of expression.

Origin of misconceptions

The heart is placed in the middle of the chest with its point directed to the left, where it is not covered by the lungs as it is on its right side. The contraction of the heart is especially noticeable in this place and it gives an impression that the whole heart is concentrated there. The shape of the heart is that of a cone with blood vessels emerging from the top. It was a simple matter for an artist to "improve" on it and draw a picture of the heart as we see it now on playing cards.

Every excitement affects the nervous system and it reflects upon the action of various organs including the heart. Since any change in the heart activity is more conspicuous than that of any other organ, it creates the impression that the heart is the chief organ involved in the various emotional outbursts. From this it was easy to suppose that the heart was the seat of the emotions. As a corollary to this conclusion it was only logical to say that a sympathetic, kind person had a more responsive, more impressive or *soft* heart. On the contrary a man lacking sympathy had a *hard* heart.

Structure of the heart

The heart is a hollow muscular organ divided into halves: left and right, each representing a separate pump. The right half pumps the blood through the lungs only, and therefore it is weaker than the left half, which has to supply every part of the body with blood. Each half is subdivided vertically into two parts: auricles and ventricles. The auricles serve to collect the blood while the ventricles are the pressure pumps. Like every pump they possess two valves, one at each entrance. On account of these valves blood can move in only one direction and that is why we speak about blood circulation.

Function of the heart

The function of the heart consists in maintenance of the blood circulation. When the ventricles contract, they compress the blood, which causes the closing of the valves leading to the auricles and opening of the valves leading to the arteries with the result that about two ounces of blood are forced out from each ventricle into the arteries.

The Pulse

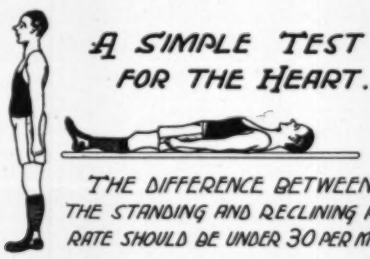
Every contraction of the heart increases blood pressure in the arteries. Since the blood is a liquid and therefore incompressible, the added pressure results in a slight bulging of the arterial walls. It starts of course at the heart and then is transmitted in a wave-like fashion along the arteries and is recognized as the pulse. It is obvious that each pulsation corresponds to a heart-beat, and we can count the heart-beats by counting the pulse.

The pulse-rate varies in different people. It depends on the rate of life process (metabolism) of the person. Younger people therefore have a faster pulse-rate than older people. Smaller people usually have a faster pulse-rate than people of large stature, although exceptions are not infrequent. Napoleon, who was a small man, had a pulse-rate of 40 per minute. It is unfortunate that people often refer to the average pulse as the "normal" pulse. It is true that a normal pulse usually lies within the limits of an average *zone*, but this does not mean that average and normal are the same. It would be a good idea for every athlete to know his own normal pulse. Strange to say this is not always easy to find. One of the most ridiculous procedures can often be observed in the schools when a physical director or a nurse or even a physician at-

tempts to find a normal pulse in the children. One sees a group of children passing by the examiner, who counts their pulses for fifteen or twenty seconds. This test at best is purely perfunctory and means little if anything. First of all, children do not wait quietly before the test. They constantly move, talk to each other, play, fight with each other. If they are disciplined too severely, they become excited. All these factors change considerably the pulse-rate. Therefore the data collected under those conditions cannot be accepted as reliable.

Pulse and body position

A mere change in body position affects the pulse-rate. The more erect the position, the more energy is required to maintain it. The pulse-rate therefore becomes faster. This change is considered one of the simplest tests for the heart. Compare the pulse-rate per minute in the lying and standing positions. If the difference is less than



thirty, the heart is likely to be functioning well. If the difference is more than thirty, the patient requires a more careful examination. To make this test reliable, the man should remain in each position for about three minutes. Parkinson found that the difference in these two positions in athletic soldiers was about 10. Schneider and McCurdy have always considered a small difference as a good index of athletic fitness.

The pulse-rate and exercise

Every working muscle requires more nutritive materials, more oxygen, and produces more excess waste products than a resting muscle. This can be done only through a greater volume of blood passing through the muscle. If only a small group of muscles is involved, this can be achieved by opening some spare capillaries and closing them somewhere in the neighborhood, thus diverting the blood to the working muscles. If large groups of muscles are involved, then an increase in the blood supply can only be accomplished through a greater output of blood by the heart. This can be done in two ways. Either more blood will be sent out with every systole (stroke-volume) or the pulse-rate will be increased. When the demand is not too great, the first adjustment will suffice and the stroke-volume will rise to four or five ounces. Especially is this true with trained athletes. Since their hearts are more powerful, they can send more blood with every contraction, and therefore the pulse-rate need not be increased as much as in non-athletes. When the demand on the circulation becomes great, then the heart rate invariably increases. The maximum rate is usually reached within one minute. The acceleration may be noticed one heart beat after the beginning of the exercise. After the maximum has been reached, it will remain steady for a while and then may rise again. With the discontinuation of the exercise, the pulse-rate gradually comes to normal. Exercises of speed usually produce a greater change in pulse-rate than exercise of force like weight lifting.

The increase in the pulse-rate depends chiefly on the ability of the subject to absorb oxygen. Experiments on the noted marathon runner DeMar showed that when an inexperienced runner had a pulse-rate of 160 per minute, DeMar had only 118, yet both of them used the same amount of oxygen. The remarkable endurance of Nurmi may be explained by his unusual ability to utilize oxygen. Kolb observed the pulse-rate after rowing as high as 240 per minute. This rate is excessive. Yandel Henderson considers 150 per minute as a safe physiological limit.

He emphasizes the importance of keeping the pulse-rate as low as possible and thinks that the chief harm from tobacco smoking in training is caused by speeding up the heart action due to nicotin. Suppose an athlete has a pulse-rate of 70 per minute: his safety zone for the heart will be $150 - 70 = 80$. If the same boy smokes a great deal and his pulse-rate becomes, say, 85 per minute, then the safety zone will be decreased by 15 beats.

Pulse-rate and emotions

Reference has already been made to a close relationship between the pulse-rate and emotions. Under the influence of emotion of a high intensity the pulse-rate may become so excessive that the heart has no time for a proper filling with blood and contracts nearly empty. On account of this lack of blood a feeling of giddiness may develop. A coach may help a great deal by saying a few words of encouragement. Very often the athletes do not need a "pep" talk, but just a talk which will help them to calm down and regain their self-confidence.

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From the office of the National Federation of State High School Athletic Associations

The Chicago Conference

A REGIONAL conference of men interested in high school athletics seems to have become an annual affair at Chicago, although it is not provided for in the constitution or by-laws of the National Federation and it is not "official" in any way. It is merely, as its name implies, a conference at which high school men interested in athletics get together to discuss their common problems and to consider ways and means of improving not only the methods but the outcomes of interscholastic athletic activities.

Such a conference was held again in Chicago on October 27. It was attended by twenty-two men officially representing fifteen states that are members of the National Federation. There were official representatives from eastern states (Pennsylvania and Connecticut), from southern states (Alabama and Mississippi), from as far west as Kansas and Oklahoma and from the northern-most states of North Dakota and South Dakota.

There were two matters of major importance on the agenda of the conference. These were:

1. Facts relative to the present status and future policies of the Federation pertaining to the writing and publication of rules for those games in which high schools participate.

2. Methods and policies of improving officiating and the development of reciprocity agreements between the states in the matter of registering officials.

A discussion of the first of these topics revealed the fact that the National Federation now has official voting representatives on the National Basketball Rules Committee, the N.C.A.A. Track and Field Rules Committee, the N.C.A.A. Wrestling Rules Committee and the N.C.A.A. Swimming Rules Committee. The first-named of these committees is formally recognized as a "joint committee." It is made up of representatives of at least four national organizations interested in basketball, and each one of these organizations is accorded a definite number of representatives. The royalty on the sale of the basketball rule books is apportioned among the organizations represented, and these organizations in turn pay the expenses of their own representatives on the committee. This is really an ideal method of handling the matter of rules-making in which a number of different organizations are interested. Mr. L. W. St. John of Ohio State University has for years been the chairman of the basketball rules committee, and it is largely through his influence that this highly satisfactory reorganization has been brought about. We believe Mr. St. John has shown a type of sportsmanship and also statesmanship that are not as common as they ought to be among the proponents of inter-school athletics.

As suggested above, the other three committees upon which the National Federation has representation are in no sense "joint" committees but retain their character as distinctively National Collegiate Athletic Association committees. The high school representation on these committees is, therefore, purely a concession by courtesy. The National Collegiate A.A. could terminate this concession at any time. Moreover, the rules are published distinctively as National Collegiate Athletic Association rules with such special provisions for high school use as may seem advisable to the committee. All royalties on rule books sold go into the treasury of the National Collegiate Athletic Association and no part of them is used to pay the expenses of the National Federation representatives. These expenses are paid either from the treasury of the National Federation or in a few instances by the state athletic association which has been cited by having a representative from its state appointed to the committee.

All National Federation representatives on these various N.C.A.A. committees emphasize the courteous and cordial treatment accorded them. How much of the cordiality is due to the fact that there is nothing at stake in either the way of funds or prestige it is not easy to state. As a matter of fact, we can see no very good reason why these committees should not be organized on the joint plan just as the basketball rules committee is.

Mr. E. A. Thomas of Topeka, Kan., is the National Federation representative on the track and field rules committee, and during the past year Mr. C. E. Forsythe of Lansing, Mich., served on the swimming rules committee, and Mr. B. E. Wiggins of Columbus, O., served on the wrestling rules committee. Mr. Thomas and Mr. Forsythe were present in person and reported for their committees. A written report had been submitted by Mr. Wiggins.

Undoubtedly, the greatest interest was manifested in the matter of the National Federation football rules. These rules have been used in their entirety during the present season by eight states. In addition to that, at least two other states adopted certain provisions in the rules and in one or two more states they were used in conferences or districts. The Secretary reported that more than 10,000 copies of these rules had been printed and distributed during the present season.

Reports from every state using the rules were highly complimentary. We do not have any information from a single state using the rules that indicates any appreciable desire on the part of coaches, players or officials to return to the N.C.A.A. code.

[Concluded on page 32]

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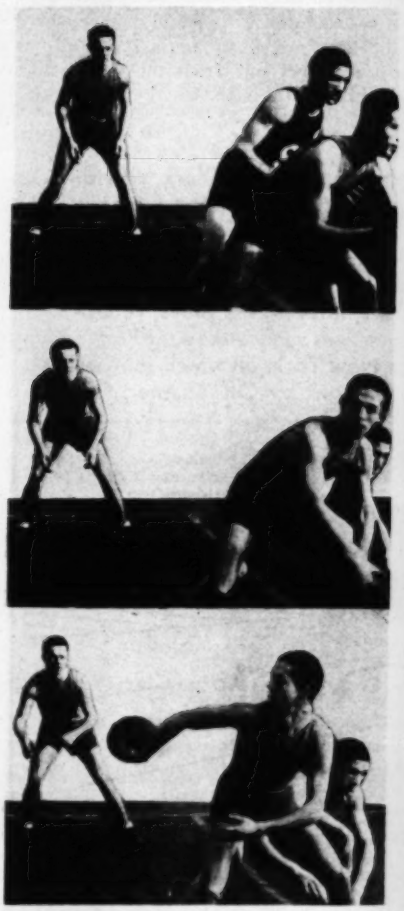
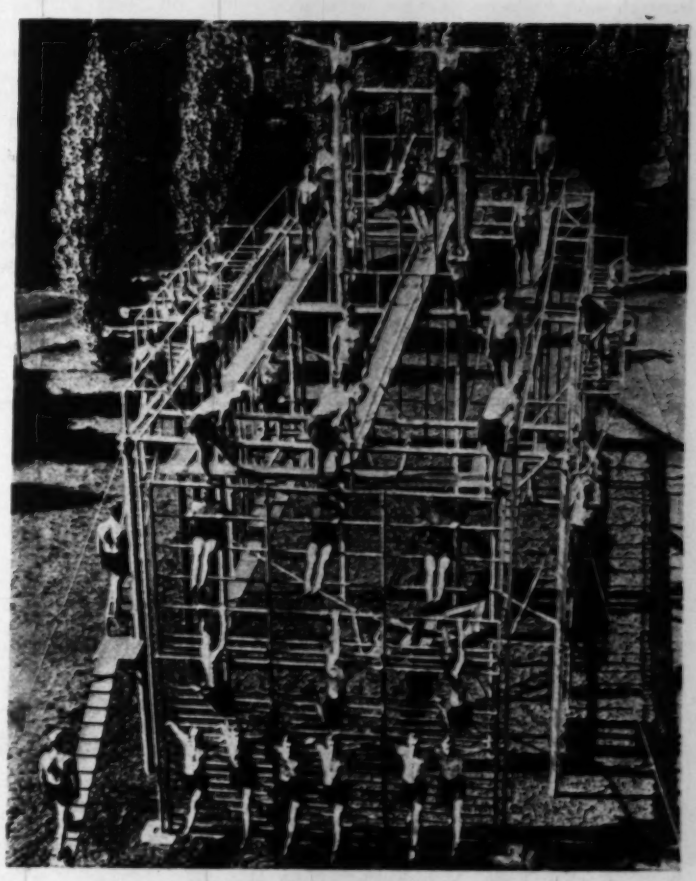
LEFT—WHERE SOCCER PACKS 'EM IN: Part of the crowd of 75,000 watching the thrilling London soccer derby between Tottenham Hotspur and Arsenal at the Highbury stadium in London. The action in the picture shows Nichols, the Spurs' goalie, clearing his lines during an Arsenal attack. (Associated Press photo.)



LEFT—A TRICK PASS FROM THE PIVOT MAN TO A TEAMMATE UNDER THE BASKET: The pivot man feints to his left to disconcert his guard, then quickly shifts the ball over to his right and despatches a back-hand pass. (Owen Reed moving pictures.)

RIGHT—THE "IRON PHILIP" ACCOMMODATES A WHOLE CLASS: The gymnastic apparatus used in a Berlin school, on which 100 students can exercise simultaneously. (Wide World photo.)



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Nat Holman, Coach of the basketball team of the City College of New York, and member of famous original Celtics.

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Details of Passing and Shooting

[Continued from page 13]

over the laces for the basket ring, not for the backboard. The knees bend, dipping the body, but the body angle at the waist must not be changed in dipping. The usual fault with young players is that they bend at the waist and drop the ball way down in making this shot. While players are learning the proper form they should not be allowed to shoot from distances way beyond the reach of their unconditioned wrists. Let them go for distance gradually, as their increasing wrist control warrants.

In making the long shot with knees together the player is on his toes, which aids his jump as he straightens his legs and arms. Some players prefer to have one foot in front of the other in getting set for their long shots. We allow this but insist that the forward foot be pointed straight and that in bending, the knees be kept even, and the player be on his toes, not on his heels. He must follow through with his arms, and his body goes toward the basket and never away from it. This applies to all shots and is most important. Never allow boys to shoot and fall away from the basket. The proper finish of the long shot is with the player off the floor, arms well extended, thumbs in and palms facing toward the basket. The player should land on his toes to be able to follow his shot at once.

In shooting, we want the ball to reach its highest point half way between the shooter and the basket. This will form the best arc for easy entry into the basket. The reason so many players fail to get sufficient arc on their shots is because they release the ball by bending the trunk and by not allowing the arms to be extended upward and forward.

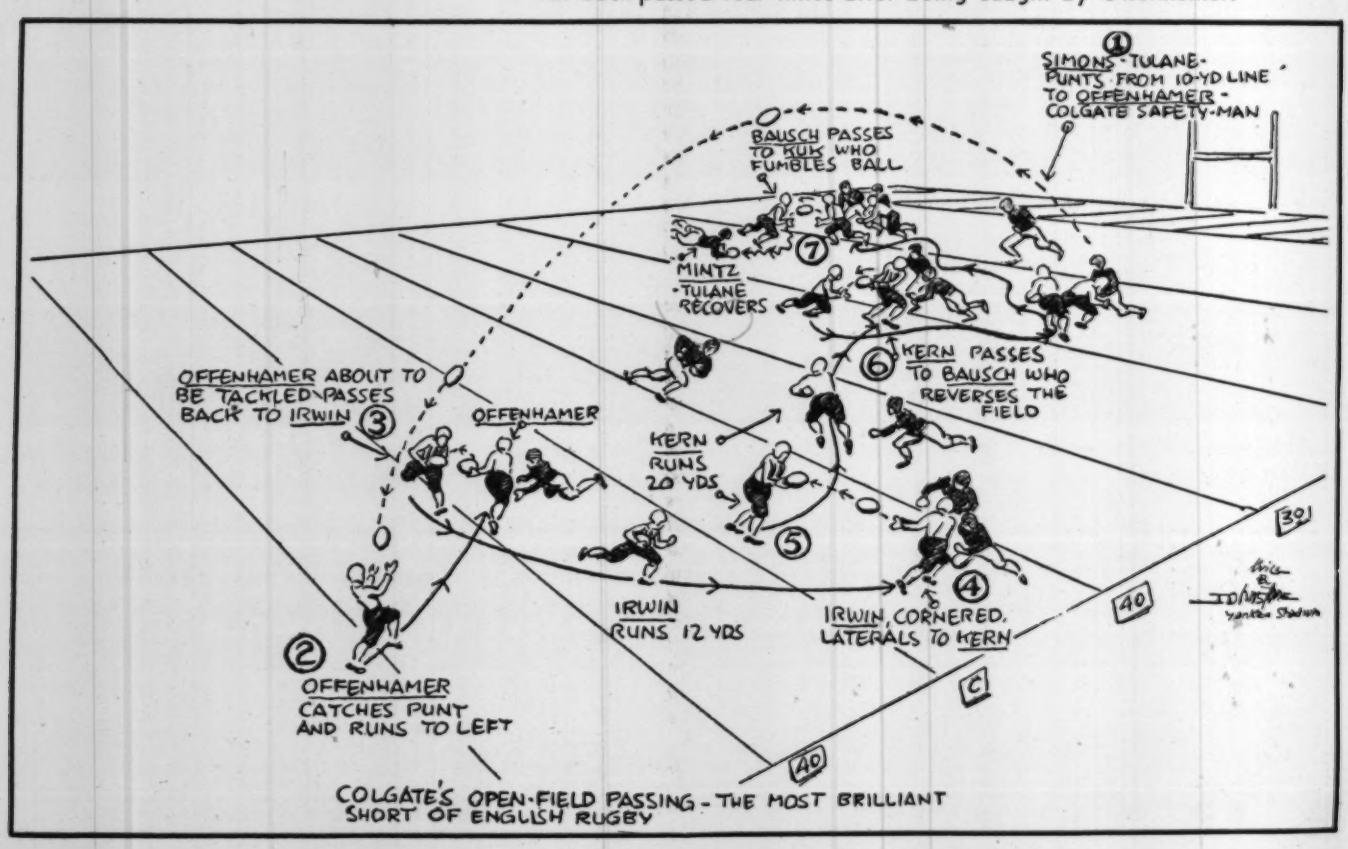
Form on close-up shots should be emphasized. The insistence on care, accuracy and thoroughness should never be relaxed. Give the boys long drills on the so-called easy, set-up shots—the lay-up and crip shots, the standstill 10-footers—then follow with scrimmages when the next-to-the-hardest test can be applied. On close-up shots there are several important points to be considered. The player cutting for the basket should approach at an angle of about 45 degrees, if possible, and in a direct line, not in an arc. The straight line is the shortest path between two points, but it seems that most young basketball players cannot apply this geometrical commonplace to the basketball court. They like the swing or swagger of cutting in a curved path, and to correct them I place a chair, or stand myself, just on the edge of what would be the direct route to the basket, and have them cut close by it on a straight line.

Right-handed players leap off their left foot in shooting, and left-handed players leap off their right foot. It is a great advantage to a player to be able to shoot skillfully with both hands, and there is an ever increasing number of high school players developing with this ambidexterity.

Upon receiving the ball, the cutting player should immediately raise it without "pumping" it down, leap into the air, extend his shooting arm as high as possible, with the other hand helping to steady and guide the ball. He should place the ball gently against the board, about a foot above the basket, releasing the ball with a slight turn of the wrist, imparting favoring spin to the ball. The use of spin must be carefully watched, for the tendency is to call upon it to carry the ball into the basket from contact points on the board far from the basket. The player should keep his eyes on the basket until the ball has either entered it or missed it. This means no twisting or turning of the body going into the basket. Some players will not jump straight up into the air on this shot, but will "broad-jump" far under the basket, from which point they will not be able to return as quickly to the action in case the goal was missed. We like to have them land not much beyond the end line even on the flying shots. Boys accustomed to running quite far under the basket in shooting are at a disadvantage when called upon to play on a floor where the baskets are flush against a wall, or only a few feet out from the wall.

We prefer to have the boys who are

BELOW—Drawing by Will B. Johnstone in the New York World-Telegram, inspired by the lateral-passing proclivities of the Colgate University team, coached by Andy Kerr, former Schenley High (Pittsburgh), Pitt freshmen, Stanford, W. & J. coach. Colgate moves from a double wingback formation; arranges for trailer to ball-carrier on many plays, notably forward-pass plays, lateral-pass plays, receptions of kicks. Mr. Johnstone's drawing is an accurate record of a play during the Colgate-Tulane game in New York, on which the ball was back-passed four times after being caught by Offenhamer.


1 SIMONS - TULANE - PUNTS FROM 10-YD LINE TO OFFENHAMER - COLGATE SAFETY-MAN
BAUSCH PASSES TO KUK WHO FUMBLES BALL
7 MINTZ - TULANE RECOVERS
6 KERN PASSES TO BAUSCH WHO REVERSES THE FIELD
OFFENHAMER ABOUT TO BE TACKLED PASSES BACK TO IRWIN 3
OFFENHAMER
KERN RUNS 20 YDS
5
4 IRWIN, CORNERED, LATERALS TO KERN
IRWIN RUNS 12 YDS
2 OFFENHAMER CATCHES PUNT AND RUNS TO LEFT
30
40
C
40
COLGATE'S OPEN-FIELD PASSING - THE MOST BRILLIANT SHORT OF ENGLISH RUGBY

not ambidextrous in shooting to use two hands when shooting off their weak side, rather than lay the shot up with one hand, even though it is their strong hand. I have found that right-handed boys, for instance, in shooting lay-up shots from the left side and using only their right hand, all too frequently miss the basket. They would do better by using both hands on the ball all the way through the shot. Our rule is that if the player cannot shoot accurately with either hand that he use his right or left hand on his good side and both hands on his weak side.

The most common fault in players executing the lay-up shot is that they don't *lay it up,* but frequently *bang it up.* The faster his cut for the basket the greater the need for a gentle, soft lay-up. Long drill on this, at various travelling speeds, will find its reward in more goals scored and fewer missed on rush plays of this type.

Another practice that pays dividends is drill in following-up your own team's shots. A good team should be able to take the ball off both boards, yet the greatest common weakness seems to show itself in the general failure of teams to get the ball back again off their own board.

The players should be drilled in timing their leaps after rebounds off the board. They should go up into the air with outstretched arms and hands, reaching the ball as it descends to the limit of their reach. This timing is important, because a player who goes up before the ball has descended to the accessible height will find himself coming down empty handed. A fraction of a second is all that marks the difference between success and failure on these leaps after rebounds.

Though the arms and hands are outstretched in leaping up after rebounds off his own board, the player should keep his fingers cupped, so that when he touches the ball he can release his cupped fingers and send the ball back up toward the basket while he is still in the air. This is better than batting or slapping it back up toward the basket, for it allows for more control.

Among the various lesser shots the hook shot is perhaps the most valuable. Not every player can execute it successfully, and it is usually the mark of a good all-around player. The difficulty encountered by novices in this shot is that they cannot retain full control over the ball long enough in the up-swing of the arm from the side and over the head. The ball should never be released until the arm is high in the air. The final, exact direction of the ball can be very well controlled by the fingers. In the hands of skilled players the hook shot is a most valuable weapon. It is also a shot that is readily converted into a hook pass at the final moment.

Foul shooting

We encourage our players to use the underhand, toss method of throwing fouls, but if there are boys who cannot seem to muster confidence in themselves with this style, we allow them to use whatever style they prefer; if it succeeds, all is well; if it fails, they will probably be perfectly willing to try the more orthodox style. The player should walk to the foul line, be sure his hands and the ball are dry, take a deep breath to relax, line up directly in front of the basket with the toes just off the line and feet either spread or together, whichever is the more comfortable. The ball is then adjusted in his hands. A good way is to have the fingers spread and at least three of them on the seams, which are crosswise. The thumbs should be pointed toward the basket and only the fingers should be touching the ball. The wrists should be loose. Fix the eyes on the rim of the basket. In making the crouch to release the ball, the knees should spread out slightly to permit the ball to be brought down cleanly. There must be no leaning forward or backward while lowering the ball. The downward motion should be slower than the upper motion, but the shift must not be jerky. There should be but a slight bend in the arms at the elbows. The arms are mainly guides for direction. The real impetus comes from the wrists. The flip of the wrists, just as the ball is brought up to the throwing position, with the thumbs the last members to leave the ball, causes the ball to revolve toward the shooter. With constant practice a player can develop a foul-shooting pattern so well under control that he can groove himself in a certain, smooth foul-shooting action, which will hardly vary in a hundred throws. "Smooth action" is the best phrase for describing a foul shooter who can confidently step up to the line and throw one after another through the threads without touching the rim.

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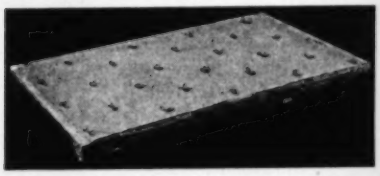

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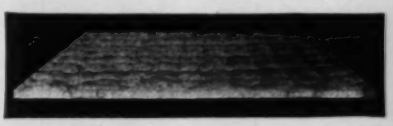

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